AD-A124 071 GENERALIZED MONITORING FACILITY USERS MANUAL(U) COMMAND AND CONTROL TECHNICAL CENTER WASHINGTON DC B WALLACK ET AL. 01 DEC 82 CCTC-CSM-UM-246-82-CHG-3 1/2

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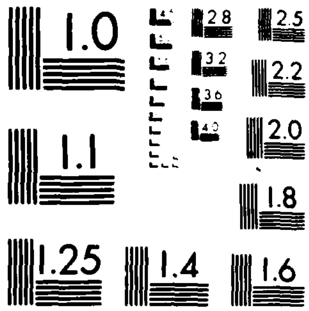

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DEFENSE COMMUNICATIONS AGENCY
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WASHINGTON, D. C. 20301

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IN REPLY REFER TO: C751

1 December 1982

TO: RECIPIENTS

SUBJECT: Change 3 to Computer System Manual CSM UM 246-82, Generalized Monitoring Facility

1. This is Change 3 to Computer System Manual CSM UM 246-82, -AD A116898 Generalized Monitoring Facility, dated 1 May 1982. Remove obsolete pages and destroy them in accordance with applicable security regulations and insert new pages as indicated below:

Remove Pages	Insert New Pages
viii	viii
ix	ix
xviii	xviii
xx	xviii.1
xxii	xviii.2
xxiii	xx
xxiv	xxii
1-1 and 1-2	xxiii
2-5 and 2-6	xxiii.1
2-7 and 2-8	xxiv
2-9 and 2-10	1-1 and 1-2
2-11 and 2-12	2-5 and 2-6
2-12.1 and 2-12.2	2-7 and 2-8
5-1 and 5-2	2-9 and 2-10
5-3 and 5-4	2-11 and 2-12
5-5 and 5-6	2-12.1 and 2-12.2
5-7 and 5-8	5-1 and 5-2
5-9 and 5-10	5-3 and 5-4
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5-15 and 5-16	5-7 and 5-8
5-17 and 5-18	5-9 and 5-10
5-23 and 5-24	5-11 and 5-11.1
5-27 and 5-27.1	5-11.2 and 5-12
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5-55 and 5-56	5-23 and 5-24
6-3 and 6-4	5-27 and 5-27.1
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6-25 and 6-26	6-6.1 and 6-6.2
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	14-18.1 and 14-18.2
	14-21 and 14-22
	14-22.1 and 14-22.2
	14-23 and 14-24
	15-1 through 15-64 (new section)
	16-1 and 16-2
	17-1 and 17-2

2. The effective date of these change pages is 1 December 1982.

3. When this change has been made, post an entry in the Record of Changes and file this letter before the title page.

FOR THE DIRECTOR:

87 Enclosures

For ALAN GROSS
Colonel, USAF
Deputy Director
for Computer Services

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TABLES

SECTION 1. GENERAL

1.1 Purpose of the Users Manual

The Users Manual describes each of the programs in the Generalized Monitoring Facility (GMF), discusses input options required to run each program, and provides sample outputs generated by each program.

The Generalized Monitoring Facility is delivered on a FILSYS SAVE tape. A description of the software is presented in section 2. Installation procedures for the GMF Monitor and guidance on how to run GMF can be found in section 5 of this manual.

1.2 Project References

The Generalized Monitoring Facility was originally developed for the Government by Honeywell Information Systems. Since delivery of the completed software in 1975, the Computer Performance Evaluation Branch (C751) of the Command and Control Technical Center has extensively modified and rewritten the GMF system. Numerous software errors have been corrected and many new features have been added.

1.3 Terms and Abbreviations

The following abbreviations will be used throughout the document.

CAM	-	Communications Analysis Monitor
CM	-	Channel Monitor
CPU	-	Central Processing Unit
CPUM	-	CPU Monitor
GCOS	-	Generalized Comprehensive Operating System
GMC	-	Generalized Monitoring Collector
GMF	-	Generalized Monitoring Facility
GRTS	-	General Remote Terminal Supervisor
GRTM	-	GRTS Monitor
IDLEM	-	Idle Monitor

MSM - Mass Storage Monitor

MUM - Memory Utilization Monitor

RMC - Resource Monitor Collector

RMDRx - Resource Monitor Data Reduction Program 1 through 3

RMON - Resource Monitor

TM - Tape Monitor

TPEM - Transaction Processing Executive Monitor

TSSM - Timesharing Subsystem Monitor

WWMCCS - World Wide Military Command and Control System

1.4 Security and Privacy

There are no classified data collected in the GMF, but there is one exception. If the Communications Analysis Monitor (CAM) is being run with the Specific Terminal Option, classified data may be collected.

1.5 Manual Format

Section 2 of this Manual provides an overview of the GMF system. A brief description of each program is included. Sections 3 through 12 and 15 describe the programs of the GMF system in detail. In the presentation the user will find the appropriate information to successfully operate each program. The format of the sections includes a discussion of each program in the input, processing, and output phases. Section 13 of the document describes the procedures that a user should follow if it is desired to create a new GMF monitor and section 14 provides detailed information as to how GMF should be used in conducting a complete system-wide evaluation.

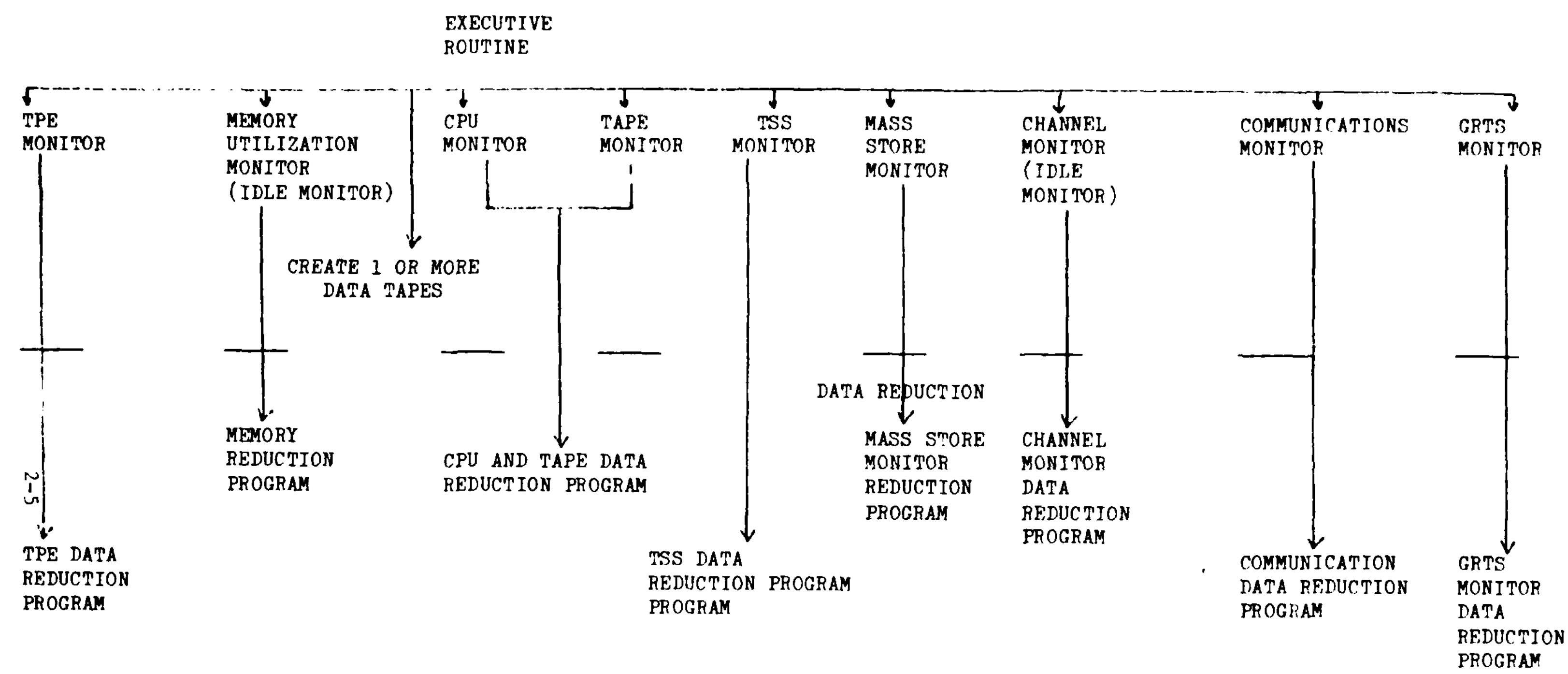

Figure 2-3. Programs in the GMC Subsystem

Data Collector Programs	Subroutines	Traces Captured
Memory Utilization Monitor	T10 T46	10,11,51 46
Idle Monitor	T21 TRCS	21 0,1,2,3,13,16,22,37,65
Mass Store Monitor	T7	7,15,73*,76*,77*
Channel Monitor	T4,T7,T22	4,7,15,22
Tape Monitor	T50	50,51,52
CPU Monitor	T70	10,11,21,70*
Communications Analysis Monitor	T14	14*
GRTS Monitor	T62	62*
TPE Monitor	T200	0,1,2,4,5,6,13,42,51,65,74*
TSS Monitor	T100	74*

* - Nonstandard traces generated by the particular monitor.

Figure 2-4. Subroutines and Traces in GMC Data Collector Programs

2.4 System Organization

The GMF is composed of two data collectors, GMC and RMC, and associated data reduction programs. Sections 3 through 12 describe these programs. Figure 2-1 gives a system flowchart for the RMC. Figure 5-1 gives a system flowchart for the GMC.

2.5 Performance

The GMF monitors the performance of a system, aids in identifying the start of system performance problems, and aids in analyzing system performance problems. The RMC requires very little system resource usage and writes all its data to the system accounting file. The GMC is a much more detailed system with the associated higher overhead. The GMC is used mainly to determine the cause of system performance problems. The GMC requires 15 to 24 thousand words of memory and one tape drive while being run. Both systems require offline data reduction.

2.6 GMF Installation

2.6.1 Creation of GMF Files. The GMF software is contained on a single user save tape. The USERID on the tape is B29IDPXO. This USERID must be created with 3950 LLINKS of file space. A user restore can then be run. B29IDPXO is subdivided into several catalogs described below:

- GMFCOL - 530 LLINKS - This subcatalog contains all the data collection software for the GMC monitoring system. All files within this subcatalog are completely described in section 5.

- SOURCE - 2450 LLINKS - This subcatalog contains Time Sharing source files for all data reduction programs contained within the GMC system. Figure 2-5 is a breakdown of the individual files within this subcatalog. Sections 6-12 describe each program in detail.

- OBJECT - 1390 LLINKS - This subcatalog contains the object decks for all the data reduction programs contained within the GMC system. Figure 2-5 is a breakdown of the individual files within this subcatalog.

- JCL - 16 LLINKS - This subcatalog contains all the JCL required to run all the data reduction programs contained within the GMC system. Figure 2-6 is a breakdown of the individual files within this subcatalog.

- RMON - 345 LLINKS - This subcatalog contains all the software required to collect and reduce the data for the RMON Monitoring system. This subcatalog is further subdivided into JCL, SOURCE and OBJECT subcatalogs. The files within these subcatalogs are completely described in sections 3 and 4.

FILE NAME	FUNCTION	SOURCE SIZE (LL)	OBJECT SIZE (LL)
MUM	MEMORY UTILIZATION MONITOR DATA REDUCTION PRO-. GRAM. REFERENCED IN SECTION 6.	375	220
MSM	MASS STORE MONITOR DATA REDUCTION PROGRAM. REFERENCED IN SECTION 7.	320	190
CM	CHANNEL MONITOR DATA REDUCTION PROGRAM. REFERENCED IN SECTION 8.	254	182
CAM	COMMUNICATION MONITOR DATA REDUCTION PROGRAM. REFERENCED IN SECTION 9.	184	110
CPU-TAPE	CPU AND TAPE MONITOR DATA REDUCTION PROGRAMS. REFERENCED IN SECTION 11.	390	155
GRT	DATANET 355 MONITOR DATA REDUCTION PROGRAM. REFERENCED IN SECTION 10.	280	154
TPETG	TRANSACTION PROCESSING DATA REDUCTION PROGRAM. REFERENCED IN SECTION 12.	64	71
TPEALT	AN ALTER FILE FOR ADDING TPE TRACE CODE INTO THE TPE SUBSYSTEM (NO OBJECT FILE). REFERENCED IN SECTION 12.	14	
TPEDUMP	A PROGRAM FOR OBTAINING A FORMATTED TRACE DUMP FROM A TPE/GMF DATA TAPE. REFERENCED IN SECTION 12.	38	26
TSS	TIMESHARING MONITOR DATA REDUCTION PROGRAM. REFERENCED IN SECTION 15.	530	282

Figure 2-5. B29IDPXO/SOURCE and B29IDPXO/OBJECT Catalog Structure

FILE NAME	FUNCTION	SOURCE SIZE (LL)
MUM	JCL TO OBTAIN ALL MEMORY UTILIZATION MONITOR REPORTS	2
MSM	JCL TO OBTAIN MASS STORE MONITOR REPORTS	2
CM	JCL TO OBTAIN CHANNEL MONITOR REPORTS	2
CAM	JCL TO OBTAIN COMMUNI-CATION MONITOR REPORTS	2
GRT	JCL TO OBTAIN DN-355 MONITOR REPORTS	2
CPU-TAPE	JCL TO OBTAIN CPU AND TAPE MONITOR REPORTS	2
TPETG	JCL TO OBTAIN ALL REPORTS FROM THE TPE DATA REDUCTION PROGRAM	2
TSS	JCL TO OBTAIN ALL REPORTS FROM THE TSS DATA REDUCTION PROGRAM	2

Figure 2-6. B29IDPXO/JCL Catalog Structure

2.6.2 GMF Release Dependent Parameters. In order for the GMC to operate properly, it is necessary for GMC to locate certain instructions and/or words within several system programs. The user should insure that these locations are correct for the particular GCOS release, under which he is operating. Table 2-1 is a list of these dependent parameters identifying their the use and providing the approximate program source line numbers where the particular parameters are used. The list is provided for each GMC program that must checked by the user.

In order to use the GMC data reduction programs on a WW6.4 system, there is a special data card required in certain programs. This option applies to all data reduction programs except CPU-TAPE and TPETG. The TPETG program is not designed for use under any release other than WW7.2. The CPU-TAPE program would require a one-line source change to be used under a WW6.4 release.

The GMC system is designed so that data collected on a WW6.4 system may be reduced under a WW6.4 system or a WW7.2 system. In addition, data collected under a WW7.2 system may likewise be reduced under a WW7.2 system, or a WW6.4 system. Whenever the data reduction programs for MUM, CM, CAM, or GRT are used on a WW6.4 system, a data card with an RN typed on it must be included in the input section of the JCL deck. It makes no difference under what release the data was collected. It is only a question of under what release the data is being reduced.

For the MSM data reduction program, there are two data cards required. The first data card always contains the letters RN. The second card is determined by the following table:

Data Collected	Data Reduced	Data Value
WW6.4	WW6.4	1
WW6.4	WW7.2	3
WW7.2	WW6.4	2
WW7.2	WW7.2	NO SPECIAL CARDS REQUIRED

For the CPU-TAPE data reduction program, it is required to delete source line #4320 and recompile when using the data reduction program under a WW6.4 release.

The RMC System is also designed to run under GCOS release WW6.4.2 (commerical release 2H), or WW7.2 (commercial release 4JS (any level)). See subsection 3.3.1 for details as to required modifications.

Table 2-1. GMC Release Dependent Parameters

Program	LINE #	Variable	Explanation
GMF.TOP	90	SYS64	Used to control conditional assembly of GMC set=1 for W6.4(2H) release set=0 for W7.2(4J) release
	10220	-	Code in this area searches for trace processing within the dispatcher. Trace code must be within 500 octal locations of the address specified by entry pt 15 decimal of the dispatcher. The code being searched for is a LDAQ;STAQ;TRA0,1
	10700	-	Code in this area is used to make a correction to accounting processing, if the correction has not already been made via patches. The code is searched for within 500 octal locations of .MIOS entry point. The code searched for is SBLA TRREG+7,$;ARL 12; ADLA .CRTOD,7. The ARL is changed to an ARS.
CPU.PAT	10	-	Code in this area searches for an ASA .SALT,5 Instruction in the dispatcher.
	210		In W6.4 search octal locations 1500-1700. In W7.2 search octal locations
	230		2340-2450. In addition in W7.2 we need to find a STQ .QTOD,4 instruction
	420		between octal locations 2400-2460. For both releases we need to find 8 words of patch space. In W6.4
	720		between octal locations 3540-3740. In W7.2 between octal locations
	740		4600-5000. If not found here then
	1460		search octal locations 4150-4300 in
	1480		W6.4 or octal locations 5400-5530 in W7.2 all offsets are from the entry point of .MDISP. In addition .MFALT is searched in W7.2 for an ARL 12 instruction
	1190		between octal locations 2500-2550 (offset from the entry point). This is for gate locked timing code which is supposed to be assembled into W7.2 code.

Program	LINE #	Variable	Explanation
CAM.INIT	350	-	Beginning at 1400 octal locations from the entry point of .MDNET and continuing for 5000 octal locations search for a ANA=0777777,DL (777777375207) instruction, followed by a CMPA (000000115210) instruction. This searches for # special interrupts processed code (NSIP).
	510	-	Beginning at the CMPA location found above in .MDNET and continuing for 3000 octal locations search for a ANA=077 followed by a CMPA=077. When found, back up 30 octal words and look for an AOS instruction. This searches for the # of lines waiting mailbox code (R01XCT).
CAM.PAT	10	-	Code in this area searches for a LDQ M.LID,3 instruction in DNWW, followed by a ANQ =0077777,DU instruction. Octal
	140		locations 5000-6000 are searched (offsets are from entry point). Ten words of patch space must also be obtained. This patch space must be between octal locations
	370		11100 and 11200 (offsets are from entry point). If patch space is not found then 7 words of patch space are searched for within the dispatcher. This search is performed between octal locations
	720		3540-3740 in W6.4 and octal locations
	740		4600-5000 in W7.2 (offsets are from entry point). It should be noted that in commercial releases and WW7.2, DNWW is referred to as DNET.
MSM.PAT	10	-	Code in this area searches for an AOS .CRTDL instruction and an AOS .CRTBH instruction in the dispatcher. In W6.4
	390-680		and W7.2, these need to be within 300 octal locations of the label DBASE. If these instructions are not found, a search is made from octal locations 4600-5100 in W6.4 and octal locations 7164-7464 in W7.2. In addition, 8 words of patch space is needed. In W6.4 between octal
	850		3540-3740. In W7.2, between octal
	870		4600-5000. If the patch space is not found then search between octal locations
	1320		4150-4300 in W6.4, or octal 5400-5530 in

Program	LINE #	Variable	Explanation
	1340		W7.2. All offsets are from the entry point of .MDISP. In addition in W7.2 FMS CACHE logic is also analyzed. See label TSFIO in routine T7 for locations required within FSIO module.
GMF.MON	840	FMS1	Offset from entry point of .MFSIO which points to the word giving the absolute address of FMS catalog cache buffer. Used only in W7.2. Set to -13 decimal.
	850	FMS2	Offset from entry point of .MFSIO pointing to the work which gives the option selection for FMS catalog cache. Used only in W7.2. Set to -15 decimal.

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SECTION 5. THE GENERAL MONITOR COLLECTOR - DATA COLLECTION PROGRAM

5.1 Introduction

The General Monitor Collector (GMC) data collection program is a privileged slave program which processes GCOS system trace data, organizes the data in GMC records, and writes the collected GMC data records on its output magnetic tape. The general concept of operation for the GMC facility is shown in figure 5-1.

As a privileged slave program, the monitor data collector requires the permission of the system operator to run and must execute in master mode. The master mode capability allows the GMC to access all of the system main memory. The areas of interest are the system Communication Region (CR) and the individual job Slave Service Areas (SSAs).

The GMC is actually a series of independent data collection monitors which are controlled via the central Executive Routine (ER) (described in subsection 5.3.1), and which use a common buffering routine for writing collected data to a common tape. The current GMC is comprised of 10 different monitors, which can be executed independently, or in any combination, except that TPE and TSS monitors cannot be run simultaneously. The monitors are described in this section. Each of the monitors has a dedicated data reduction program that produces formatted reports. These data reduction programs are described in sections 6 through 12 and 15.

The GMC can obtain control from the system in one of three ways. First, the standard manner is for the GMC to obtain control via the normal system trace. Second and third, GMC may also gain control in two nonstandard manners. These are via internally created system sub-traces (referred to as IT traces) and direct transfer patches (referred to as DT traces).

In the first way, the standard mechanism used by the monitor for obtaining control from the operating system is the normal GCOS system trace. The system trace capability records a history of the occurrence of as many as 72 system events, 64 of which are presently defined. This recording takes place in a circular table in the Communication Region of memory and is accomplished by execution of a unique code set resident in the system Dispatcher Module (.MDISP). Execution of this code is common to all system trace events and provides the point at which the GMC obtains control. The initialization portion of the GMC locates the system trace code set and implants a transfer instruction to the GMC executive. Thus, whenever a system trace event occurs anywhere within the system, the GMC executive will obtain control.

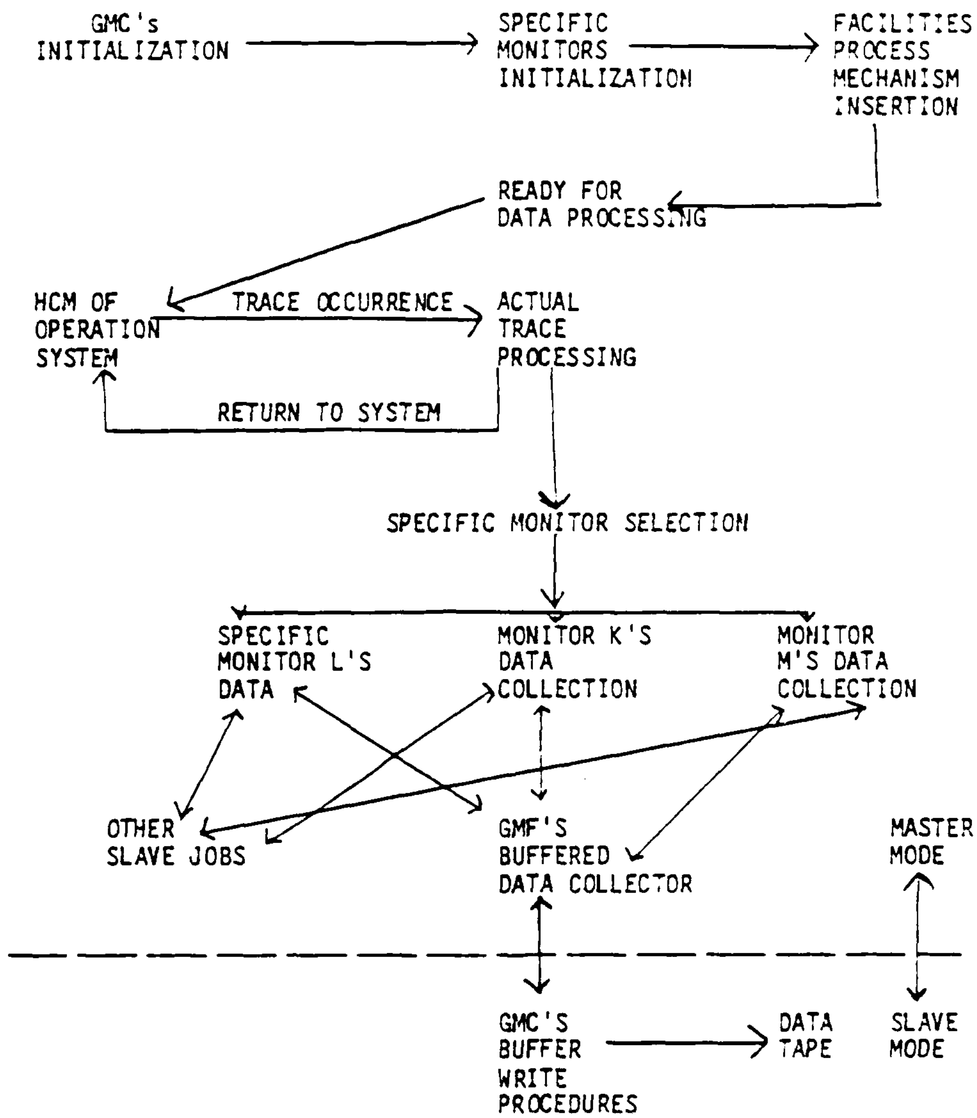

Figure 5-1. GMC Concept

After obtaining control, the system trace recording is completed using normal system procedures and then the trace is investigated. If an executing GMF monitor requires this trace type, control is given to that monitor. The monitor then collects data of interest to itself and requests the GMC executive to buffer the data. When the monitor completes its task, it returns control to the GMC executive. The GMC executive then transfers control back to the system trace processing routine within the GCOS dispatcher. The activities mentioned above take place in master mode under the guise of an extension of normal system trace procedures.

The second method used by GMC to gain control is for GMC to create its own system traces. The GMC will search a given GCOS module for a known line of code. It will replace this line of code with a transfer to a patch area. In the patch area, the monitor will insert code to create a new GMC system trace. At this point, the execution of this code will be processed just as all other system traces are processed. This procedure is used only when the Communication Analysis Monitor is selected for execution. (See subsection 5.2.6 for a complete description of this procedure.)

The third method used by GMC to gain control is via a direct transfer from a GCOS module. In this case, GMC will search a given GCOS module for a known line of code. It will replace this line of code with a direct transfer into the GMC. This can be accomplished since GMC is locked in core during its entire execution. The benefit of this procedure is that the overhead of the system trace is eliminated. This procedure is used only when the Mass Store Monitor or the CPU Monitor is selected for execution. (See subsections 5.2.2 and 5.2.3 for a complete description of this procedure.)

As the GMC ER buffers the collected monitor data. it will determine when one of the internal buffers are filled and must be written to tape. At this point, it will establish a normal slave dispatch to its tape writing facility. The tape writing facility will then write the internal buffer to tape and signal the executive that this buffer may be reused.

5.2 GMC Monitor Subroutines

In this subsection, each of the ten monitor subsystems will be addressed. Each subsystem requires that specific trace types be enabled in the H6000 system boot deck on the
$ TRACE card. A detailed discussion of the computer system boot deck used for startup and $ TRACE operations is contained in the GCOS System Startup Manual and in the System Tables Manual. GMC cannot be used to turn on or off a TRACE option. The GMC user must request the computer system manager to change the system boot deck $ TRACE card to meet the minimum GMC requirements. If all the required trace types are not on, GMC will abort with a T0 through T8 and TA abort. The hexadecimal digit immediately following the letter T indicates the monitor number for which the proper traces are not active. See table

5-1 for a quick reference of required trace types for each monitor and refer to table 5-2 for all GMC abort codes.

5.2.1 Memory Utilization Monitor. The Memory Utilization Monitor (MUM) is used to measure memory utilization. For a detailed description of reports containing data collected by this monitor, see section 6.

When MUM is active it is essential that GCOS system trace types (octal) 10, 11, 46 and 51 are enabled in the computer system boot deck $ TRACE card. MUM collects data upon the occurrence of those traces and builds its records which are then passed to the Executive Routine (ER) for buffering. A separate discussion of the format of the MUM collected data records is contained in subsection 5.4.2. MUM requires that at least the following segment numbers from table 5-3 be used to generate the GMC R* file:1, 2, 11, 19, 23, 26 and 27. The complete process for generating an R* file is described in subsection 5.6. It should be noted that this version of MUM will not collect any idle trace information and therefore not all MUM reports will be produced during data reduction. See section 6 for description of reports that will not be produced.

If the user wants all the MUM reports produced, then the Idle Monitor must be made active, along with the Memory Monitor. To do this, GCOS trace types (octal) 0, 1, 2, 3, 10, 11, 13, 16, 21, 22, 37, 46, 51 and 65 must be enabled. In generating the R* file the following segment numbers should be used: 1, 2, 10, 11, 19, 23, 24, 25, 26 and 27. It should be noted that when the Idle Monitor is active the amount of data collected will be about double that collected when the Idle Monitor is off. The user should carefully evaluate the need for those reports produced by the Idle Monitor.

The MUM is designed so that it can accurately report all changes to the memory subsystem. It does this by processing all trace type 10's (.CALL) and all trace type 11's (.GO TO). Upon receiving these traces a further check is made to see whether a memory allocation process is being requested i.e. the use of SSA modules: .MPOP3,.MPOQ4, or MPOR5. The MUM will collect data only if one of these modules has been requested.

The first item of information reported by the MUM is the current status of all jobs waiting in the Peripheral Allocator's Queue. This information is reported so as to be better able to represent the true core demand being made by the current workload. When a GCOS system has a large number of jobs waiting core, a Core Damper Switch is set. This switch is used to prevent jobs from being sent from the Peripheral Allocator to the Core Allocator. Therefore, the Peripheral Allocator's queue may contain many jobs that would normally be in the Core Allocator's queue, were it not for the Core Damper Switch. This

Table 5-1. Required Trace Type for Each Monitor

Monitor #	Monitor	Required Trace Type
0	Memory Utilization Monitor (MUM)	10, 11, 46, 51, (Idle Monitor traces optional)
1	Mass Storage Monitor (MSM)	7, 15, 73*, 76*
2	CPU Monitor (CPUM)	10, 11, 21, 70*
3	Tape Monitor (TM)	50, 51, 52
4	Channel Monitor (CM)	4, 7, 15, 22 (Idle Monitor traces optional)
5	Communications Analysis Monitor (CAM)	14*, 15
6	GRTS Monitor (GRTM)	62*
7	Transaction Processing System Monitor (TPSM)	0, 1, 2, 4, 5, 6, 13, 42, 51, 65, 74*
8	Idle Monitor (IDLEM)	0, 1, 2, 3, 13, 16, 21, 22, 37, 65
A	TSS Monitor (TSSM)	74*

*These are not standard traces. They are specially created by the GMC or by an editing of the GCOS TPE Subsystem in the case of trace type 74. Trace types 70, 73 and 76 are direct transfers into the GMC and as such are not required to be active via the $ TRACE card in the system boot deck. Trace types 14, 62 and 74 do use the System Trace Function and require the Trace Number to be active on the $ TRACE card.

Table 5-2. Abort Codes (Part 1 of 3)

B2 -	Illegal SNUMB on MSM data card (more than 5 characters).
B3 -	More than 5 SNUMBs for MSM SNUMB option.
BC -	Illegal request on limited connect option.
BK -	Backspace of the full data tape was bad. Multireel will not be collected. Check for tape drive problems.
BS -	Bad tape status. Check condition of tape and rerun job.
C1 -	CPU Monitor turned off but SNUMB input requested on the data card.
C2 -	Illegal SNUMB (more then five characters) on data card for CPU SNUMB option.
C3 -	More then three SNUMBs for CPU Monitor on data card.
CD -	Illegal character in CAM special option.
CE -	Console message garbled. Check console sheet and check with operator.
CM -	Cannot move out of the growth range of TSS.
CO -	CAM turned off but special option requested.
DK -	No multireel disk file was present. Use a $ FILE card in the JCL or use the M9 option to turn off multireel capability.
DR -	Disk read-in. End-of-reel processing was bad.
DS -	Bad status of the disk write.
ER -	Wrapup record could not be written.
ET -	More than two terminals requested for CAM special option.
FN -	The IOS accounting modification could not be found. Call CCTC.
GC -	No GRTS control card.
GD -	No FEP I/O can be performed.
GM -	Needed memory for GRTS Monitor denied. Increase $LIMIT card.
GO -	GRTS Monitor illegal data card.
GS -	Extra SSA is not available for GRTS Monitor. Check $ LIMIT card.

MO-M8,MA - Monitor was not turned off and not present on the R* file. Any monitor not contained on the R* file must be turned off via the data card option. The number following the M is the monitor that was not turned off.

MM - The dispatcher hook has already been inserted. Another version of GMC must already be in execution.

N1 - The CPU Monitor hook code could not be found. See subsection 5.2.3.

N2 - Sufficient patch space is not available in .MDISP to run the CPU Monitor. See subsection 5.2.3.

N3 - DNWW/MDNET patch location could not be found. See subsection 5.2.6.

N4 - Sufficient patch space is not available in DNWW/MDNET to run the Communications Analysis Monitor. See subsection 5.2.6.

N5 - MSM patch for SSA cache analysis not found (AOS .CRTDL). See subsection 5.2.2.

N6 - MSM patch for SSA cache analysis not found (AOS .CRTBH). See subsection 5.2.2.

N7 - MSM patch space in .MDISP not sufficient for monitoring SSA cache. See subsection 5.2.2.

N8 - CPU Monitor hook code for subdispatch could not be found. See subsection 5.2.3.

NF - The Dispatcher hook code could not be found. Call CCTC/C751.

NS - A CAM abort because it could not find NSIP (# of special interrupts) address in .MDNET.

NR - A CAM abort because it could not find R01XCT (number of lines found waiting mailbox) instruction.

OE - An error in an off option was encountered. Check the data cards. There is either an illegal character on the data card or a monitor which was not compiled in the R* file (see assembly listing) has not been turned off.

OK - All went correctly.

OL - Overlap of disk file. Increase size of disk file. Check if operator failed to respond to tape mount message during multiprocessing.

Table 5-2. (Part 3 of 3)

OV - A tally overflow occurred in the MUM.T10 subroutine. Increase the size of the data area within subroutine MUM.T10, variable SIZEBUF.

RS - Routine depth requested exceeded table length.

RW - Error in initial rewind. Check tape and drive.

SB - End-of-reel processing was bad. Check tape and drive.

SD - Error setting of density.

SF - Limited reel option termed successfully.

SQ - Sequence error in the physical records.

S1 - Subroutine MUM.T10 missing

S2 - Subroutine MUM.T46 missing

S3 - Subroutine CM.T07A missing

S4 - Subroutine CPU.T70 missing

S5 - Subroutine CM.T04A missing

S6 - Subroutine CM.T22A missing

S7 - Subroutine TM.T50 missing

S8 - Subroutine CAM.T14 missing

S9 - Subroutine GRT.T62 missing

SA - Subroutine IDL.TRCS missing

SC - Subroutine IDL.T21 missing

SD - Subroutine TPE200 missing

TE - The start/stop times appear improper. Check data card.

TL - Trailer record write was bad. Check tape and drive.

TS - An OK abort directed by a time to stop command.

TW - The tally word has been garbled.

T0-T8,TA - Required system trace is not on. The number following the T indicates the monitor having the problem.

Table 5-3. GMC Catalog and File Index (Part 1 of 4)

SEGMENT #	FILE	REQUIRED	FUNCTION
1	GMF.TOP	Y	Read data card, initialization, find hook in dispatcher, and create initial record
2	MUM.INIT		Initialize Memory Monitor
3	MSM.INIT		Initialize Mass Store Monitor
4	CPU.INIT		Initialize CPU Monitor
5	CAM.INIT		Initialize Communications Analysis Monitor
6	CM.INIT		Initialize Channel Monitor
7	TM.INIT		Initialize Tape Monitor
8	GRT.INIT		Initialize DN-355 Monitor
9	TP.INIT		Initialize TPE Monitor
10	IDL.INIT		Initialize Idle Monitor
10A	TSS.INIT		Initialize Timesharing Monitor
11	GMF.MID	Y	Ensure at least one active monitor
12	CAM.PAT		Preparation for patching DNWW/MDNET for Communications Analysis Monitor
13	CPU.PAT		Preparation for patching dispatcher for CPU Monitor
14	MSM.PAT		Preparation for patching dispatcher for MSM Cache Analysis
15	PATLOOK		Searches for patch space for CPUM, CAM, MSM
16	CPUDOIT		Patch the dispatcher for CPU Monitor
17	CAMDOIT		Patch DNWW for Communications Analysis Monitor
18	MSMDOIT		Patch dispatcher for MSM Cache Analysis

Table 5-3. (Part 2 of 4)

SEGMENT #	FILE	REQUIRED	FUNCTION
19	GMF.MON	Y	Insert the trace hook for GMC traces
20	CPU.REMO		Remove CPU Patches to dispatcher
21	CAM.REMO		Remove CAM patches to DNWW/MDNET
22	MSM.REMO		Remove MSM patches to dispatcher
23	GMF.BTM	Y	Remove the trace hook, do all IO control
24	IDL.TRCS		Processes traces, 0,1,2,3,13,16,22,37,65 for Idle Monitor
25	IDL.T21		Processes trace 21 for Idle Monitor
26	MUM.T10		Processes traces 10,11,51 for Memory Monitor
27	MUM.T46		Processes trace 46 for Memory Monitor
28	CPU.T70		Processes traces, 10,11,21,70 for CPU Monitor**
29	TM.T50		Processes traces 50,51,52 for Tape Monitor
30	CAM.T14		Processes traces 14 and 15 for CAM*
31	CM.T04A		Processes trace 4 for Channel Monitor
32	CM.T22A		Processes trace 22 for Channel Monitor
33	CM.T07A		Processes traces 7,15,73,76 for Channel Monitor and Mass Store Monitor**
34	GRT.T62		Processes trace 62 for GRTS Monitor*
35	GRT.COL		Interfaces with the DN-355

Table 5-3. (Part 3 of 4)

SEGMENT #	FILE	REQUIRED	FUNCTION
36	TPE200		Processes traces 0,1,2,4,5,6,13,42,51,65 and 74 for TPS Monitor*
36A	TSS.COL		Captures trace 74 for TSS Monitor*
37	RUN.GMF		JCL to run a GMC R *
38	GMF.OBJ		File to contain a GMC R *
39	MAKE.XXX		A series of files creating different GMC R * Monitors.
39A	MAKE.MUC		Memory and CPU Monitors
39B	MAKE.ALL		Total GMC
39C	MAKE.MUM		Memory Monitor
39D	MAKE.CPU		CPU Monitor
39E	MAKE.TM		Tape Monitor
39F	MAKE.MSM		Mass Store Monitor
39G	MAKE.MCC		Memory, CPU, Communications and Idle Monitors
39H	MAKE.MCI		Mass Store, Channel and Idle Monitors
39I	MAKE.CAM		Communications Analysis Monitor
39J	MAKE.CM		Channel Monitor
39K	MAKE.GRT		DATANET-355 Monitor

Table 5-3. (Part 4 of 4)

SEGMENT #	FILE	REQUIRED	FUNCTION
39L	MAKE.CMI		Channel and Idle Monitors
39M	MAKE.MCM		Mass Store and Channel Monitors
39N	MAKE.GC		Communications and DATANET Monitors
390	MAKE.TPE		TPE Monitor
39P	MAKE.TSS		TSS Monitor

*Trace types 14,62 and 74, are not standard. They are internally generated (IT) traces.

**Trace types 70,73 and 76 are not standard. They are direct transfer (DT) traces.

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information from the Peripheral Allocator is reported only when the Peripheral Allocator is in memory and a Memory Monitor trace is about to be generated. For this reason, not all Peripheral Allocator queue changes will be reported. In order to reduce the amount of information being collected, a job's status in the Peripheral Allocator's queue is reported only for new jobs, when a job has changed activity, or when its status has changed.

After reporting any Peripheral Allocator status information, the MUM will next report the status of every job waiting for or currently using memory. Information such as the SNUMB, IDENT, USERID, Activity Number, memory demands, current memory address, whether the job is in memory or waiting for memory, and whether the job is a system program or user program is collected. This information is reported for each job only if a change has occurred from previous information that was reported. In addition, the current amount of CPU and IO time used by a job is reported in every MUM trace that is generated.

The MUM will consider a job to be a system job if it has a program number less then octal 10, or if it has no J* file and requires privity. Since the user may want to consider other jobs to be system jobs, such as HEALS or VIDEO, the data reduction program allows the user to extend this definition of system jobs (see section 6).

5.2.2 Mass Storage Monitor. The Mass Storage Monitor (MSM) is used to collect data on usage of peripheral resources. For a detailed description of reports containing data collected by this monitor, see section 7.

When the user wants MSM to be active, it is essential that trace types (octal) 7 and 15 are enabled in the computer system boot deck on the $ TRACE card. MSM processes trace types 7, 15, 73, and 76 to build its own records which are passed to ER. A separate discussion of the format of the MSM collected data records is contained in subsection 5.4.3. As has been stated earlier, trace types 73 and 76 are direct transfer traces created by the GMC, and as such need not be defined on the $ TRACE card. The MSM requires that at least the following segment numbers from table 5-3 be used to generate the GMC R* file: 1, 3, 11, 14, 15, 18, 19, 22, 23, and 33. The complete process for generating an R* file is described in subsection 5.6. If the system being monitored by the Mass Store Monitor contains SSA Cache Core, two new direct transfer traces, are created by the Mass Store Monitor in order to collect sufficient data to be able to analyze the operation of SSA Cache Core. These traces are created only if SSA Cache Core is configured. The Mass Store Monitor searches the dispatcher for a AOS .CRTDL instruction and then inserts code to make a direct transfer into the GMF. In addition, an AOS .CRTBH instruction is also searched for so that another direct transfer into the GMC can be generated. The first instruction locates the area of the dispatcher where it has been determined that the required SSA module is not in the SSA Cache Buffer and needs to be loaded from disk. The second instruction and 2460. If GMC cannot find the ASA .SALT,5 instruction, it will abort with an N1 abort; if it cannot find the STQ instruction it will abort with an N8 abort. If either abort occurs, the dispatcher code should be examined to determine if either instruction has been modified, moved, or patched. If so, the code in GMC will need to be modified.

Upon finding these instructions, GMC searches the dispatcher patch area(s) for four free locations under WW6.4 or eight free locations under WW7.2 in which to create a direct transfer trace into the GMC. This search has the same ranges as that for SSA cache in MSM. If patch space is not found, an N2 abort will occur. See subsection 5.2.2 for a description of this search procedure.

The CPU Monitor tracks the CPU usage of all system programs and accumulates CPU usage of slave jobs into a single value (see subsection 5.4.4). If the user desires, he can specify up to three slave jobs for which he wants the CPU monitor to track CPU usage, just as it does for system jobs. Subsection 5.5.5. describes this user option.

5.2.4 Tape Monitor. The Tape Monitor (TM) is used to collect utilization statistics on magnetic tape drive activity. A separate discussion of the format of the TM collected data records is contained in subsection 5.4.5. Reports containing data collected by this monitor are described in section 11.

When the user desires that the TM be active, GCOS trace types (octal) 50, 51, and 52 should be enabled in the computer system boot deck on the $ TRACE card. TM processes these trace types to build its records which are passed to the ER. The TM requires that at least the following segment numbers from table 5-3 be used to generate the GMC R* file: 1, 7, 11, 19, 23, and 29. The complete process for generating an R* file is described in subsection 5.6.

5.2.5 Channel Monitor. The Channel Monitor (CM) is used to measure I/O channel activity over tape and disk channels and contention to disk devices. A separate discussion of the format of the CM collected data records is contained in subsection 5.4.6. See section 8 for a description of reports containing data collected by this monitor.

When CM is active, it is essential that GCOS trace types (octal) 4, 7, 15, and 22 are enabled in the computer system boot deck on the $ TRACE card. CM processes these trace types to build its records, which are passed to the ER. The CM requires that at least the following segment numbers from table 5-3 be used to generate the GMC R* file : 1, 6, 11, 19, 23, 31, 32, and 33. The complete process for generating an R* file is described in subsection 5.6.

Actually, when the CM is active, sufficient data is processed for obtaining reports not only from the Channel Monitor but also from the Mass Store Monitor. The only Mass Store Monitor data that cannot be collected would be the data needed to analyze Cache Memory. If the user also wants this data to be collected, he should create an R* file from the following segments (see table 5-3): 1, 3, 6, 11, 14, 15, 18, 19, 22, 23, 31, 32, and 33. In addition, the Mass Store Monitor must be made active. There is an additional option available with the Channel Monitor. This option allows the Channel Monitor Data Reduction Program to produce a CPU Idle/IO Active Report. This report is described in section 8. To obtain this report, the Idle Monitor must be included in the R* file. In addition, all Idle Monitor traces must be active. The following segments are required to generate the R* file: 1, 6, 10, 11, 19, 23, 24, 25, 31, 32, and 33.

5.2.6 Communications Analysis Monitor. The Communications Analysis Monitor (CAM) is used to measure machine and user response time and terminal usage. A separate discussion of the format of the CAM collected data records is contained in subsection 5.4.7. The complete process for generating an R* file is described in subsection 5.6. The output reports, containing data collected by CAM, are described in section 9. When CAM is active, it is essential that the GMC generated trace type (octal) 14 and the GCOS trace type (octal) 15 are enabled in the computer system boot deck on the $ TRACE card. CAM patches the DNWW (MDNET in W7.2) module, looking for a LDQ M.LID,3 instruction followed by an ANQ =0077777,DU instruction. When the monitor is terminated, CAM removes these patches from the system. The CAM requires that at least the following segment numbers from table 5-3 be used to generate the GMC R* file: 1, 5, 11, 12, 15, 17, 19, 21, 23, and 30.

The method used by the CAM to patch DNWW/MDNET is similar to that used by the CPUM to patch the dispatcher. The CAM searches DNWW/MDNET for the LDQ M.LID,3 instruction beginning at octal location 5000 and ending at octal location 6000 (offsets from the entry point). If CAM cannot find this instruction, GMC will abort with an N3 abort. If this problem occurs, the DNWW/MDNET code should be examined to see if this instruction has been moved out of the octal range 5000-6000 due to an edit or recompile. If so, the code in CAM.PAT will need to be altered.

Upon finding this instruction, CAM then searches DNWW/MDNET patch area for 10 free locations in which to create a new system trace type 14. This search begins at octal location 11200 and continues for 100 octal locations (offsets from the entry point). If 10 free words of space are not found, then seven words of patch space are searched for within the dispatcher. This search occurs between octal locations 3540-3740 in W6.4 or 4600-5000 in W7.2 (offset from the entry point). If no space is found by either of these searches an N4 abort will occur. In this case, the user should examine the patch deck to see if a large number of patches have been made to DNWW/MDNET. If this is the case, DNWW/MDNET will need to be re-edited in order to remove these patches or else the CAM will not be able to be utilized. In addition to the above patching, CAM.INIT also searches DNWW/MDNET for certain instructions. Beginning at 1400 octal locations from the entry point, and continuing for 5000 octal locations, CAM.INIT searches for a ANA=0777777,DL, followed by a CMPA instruction. If it does not find these instructions, it will abort with an NS abort. CAM.INIT is searching for a number of special interrupts processed (NSIP). In addition, CAM.INIT will also search for a ANA=077, followed by a CMPA=077 instruction beginning at the above CMPA location and continuing for 3000 octal locations. If it does not find this instruction, it will abort with an NR abort. In this section, CAM.INIT is searching for the R01XCT processing (number of lines found waiting mailbox). If a specific terminal's traffic is to be monitored (see subsection 5.5.3), the CAM will insure that no more than two terminal IDs have been included. Invalid terminal IDs, extra terminal IDs or terminal IDs without the CAM input option request will cause the GMC to abort with a CD, CO, or ET abort. See table 5-2 for the meaning of these aborts.

The CAM also uses the GCOS trace type 15 (octal) to check for any JDAC processing or any other line switching which may occur.

5.2.7 <u>GRTS Monitor.</u> The purpose of the GRTS Monitor (GRTM) is to collect statistical data to be used in evaluating the performance of the DATANET 355 Front-End Processor (FEP). This data includes CPU Utilization, Response Time, and Terminal Performance. The collected information is sent to the GMC within the H6000, which writes the data to tape. A separate discussion of the format of the GRTM collected data records is contained in subsection 5.4.8. This tape, containing GRTM performance data and possibly data from other monitors, is used as input to a data reduction program used to produce statistical reports. (See section 10).

5.2.7.1 <u>Configuration Requirements.</u> The GRTM will execute on H6000 system with up to eight FEPs. The monitor is designed to run on the GRTS II Phase IIA (GRTS 1.2) FEP software.

5.2.7.2 <u>H6000 Configuration Requirements.</u> To run GRTM, GCOS trace type (octal) 62 must be enabled via the H6000 computer system boot deck on the $ TRACE card. The GRTM requires that at least the following segment numbers from table 5-3 be used to generate the GMC R* file: 1, 8, 11, 19, 23, 34, and 35. The complete process for generating an R* file is described in subsection 5.6.

5.2.7.3 <u>Altering of Phase II-A Software.</u> To use the GRTM, the user must modify the standard GRTS software by applying a set of alters supplied with release of the GMC software. It should be noted that in Release WW7.2 the alter cards to support the monitor are included within the standard release. The user must check the FMAC module to insure that variable FMON has been set to 1. The FMAC module must be recompiled and the macro library reloaded. Finally, all the GRTS modules should be recompiled.

B29IDPXO
GMFCOL

MAK.XXX	GMF.OBJ	PATLOOK	GMF	MUM	MSM	CM	CPU	TM
			GMF.TOP	MUM.INIT	MSM.INIT	CM.INIT	CPU.INIT	TM.INIT
			GMF.BTM	MUM.T10	MSM.PAT	CM.T04A	CPU.PAT	TM.T50
			GMF.MID	MUM.T46	MSM.REMO	CM.T22A	CPU.T70	
			GMF.MON		MSMDOIT	CM.T07A	CPU.REMO	
							CPUDOIT	

Figure 5-2. GMC Catalog File Structure (Part 1 of 2)

As an example, a PTA value of 317200 would be used to identify the pseudo terminal as being on:

IOM CHANNEL NUMBER OF HSLA	=	6
HSLA NUMBER	=	1
HSLA SUBCHANNEL	=	29
POLLED SCREEN NUMBER	=	0
MUST BE ZERO		

This is the same format used to describe subchannels within .MSECR.

A user must insure the setting of the PTA value as circumstances demand. By using the format shown above, the symbolic location PTA located in the FSUB module may be altered to reflect the user's own PTA value. The FSUB module must then be reassembled prior to bootloading the DATANET.

5.2.7.6 Abort Codes. The general abort codes listed in table 5-2 apply to specific options. Abort codes created specifically for the GRTM are listed below.

GS = SSA processing error caused by missing or invalid $LIMITS card

GC = Invalid GRTM options on data card file (I*)

GC = Missing GRTM option card

GD = No FEP I/O can be performed

GM = GEMORE unsuccessful in getting needed buffers

NOTE: GM aborts occur if another program occupies continuous memory just above that of the GRTM when buffer space is requested using MME GEMORE. Increasing the $LIMITS memory value or loading the GRTM immediately after booting the system will enhance the chances of getting DATANET buffers.

5.2.7.7 DATANET Monitor Software Description. The GRTS II system operating within the DATANET will be used in the collection and recording of various internal resource information which is then sent to the GMC executing in the host (6000) system. Monitoring functions within the DATANET have been separated into three basic monitoring categories:

a. CPU and Resource Monitoring

b. Host/FEP Response Time

c. HSLA Subchannel Monitoring

Monitor information will be passed between the DATANET and the GMC program executing in the host using the normal FICM interface.

5.2.7.7.1 DATANET-HOST Interface. The GRTM executing in the DATANET will be in the form of a pseudoterminal connected to the DATANET. Once initialized, the pseudomonitor terminal will be as any other remote terminal connected to a Direct Access (DAC) program in the host.

As part of GRTM initialization, the pseudo terminal will issue a connect-to-slave request to the DAC GMC program in the host. The DAC connect name requested will be the special monitor name of GRTMN'X' with the 'X' being a number from zero through seven which corresponds to the DATANET (0-7) that issues the connect request.

The connect-to-slave request will remain outstanding until it is answered by an inquiry issued by the GMC program. Once the request has been answered, the GRTM/GMC program connection will be made.

Since the pseudo monitor terminal will not be physically connected to the DATANET (i.e., on an HSLA S/C) the need for a special monitor "Terminal Control Block (TCB)" becomes necessary.

The special monitor TCB is necessary in order to utilize the normal FICM interface in the passing of monitor information to the GMC program.

5.2.7.7.2 Monitoring of CPU. The DATANET Monitor will collect CPU and various resource information by the placement of conditionally assembled instructions at appropriate points in the ICM and EXC modules of the GRTS II software. The information to be collected at the CPU level is independent of the HSLA subchannel and is sent to the host based upon a predefined time sampling increment for writing buffers to the host collector program. For a given buffer sent to the host, the following information is included:

a. Time Idle - The amount of time in milliseconds spent in the exec idle loop since the last buffer was sent to the host.

b. Buffer Denials - A cumulative count of buffer denials. This is a count of the number of times that the GRTS II software was unable to get a buffer for a user.

c. Buffer Availability - The number of 18-bit words currently available for buffers.

d. Number of Users - Count of the number of users currently logged on the system.

System. A separate discussion of the format of the TPSM collected data records is contained in subsection 5.4.10. The reports containing data collected by TPSM are described in section 12.

When TPSM is active, the required traces must be enabled in the computer system boot deck on the $ TRACE card (see table 5-1). A sample of the reports and run time procedures for the data reduction program can be found in the Transaction Processor System section 12. The TPSM requires that at least the following segment numbers from table 5-3 be used to generate the GMC R* file: 1, 9, 11, 19, 23, and 36. The complete process for generating an R* file is described in subsection 5.6.

NOTE: The TPSM cannot be run concurrently with the TSSM.

5.2.9.1 TPS Trace Collection. The TPSM is unlike most other GMC monitors in that monitoring of the Transaction Processing System is controlled via the operator console. Prior to collecting data, the user must alter the TPS (see subsection 5.2.9.2) and must also create a usable GMC R* file (see subsection 5.6). Once these actions are performed and a GMC execution is started, the user must still perform one additional action before data collection can begin. The TPSM is turned on or off by the console operator via the TP MESS command. The operator must request "TP MESS". When the console responds "TP MESS?", the message "TRACE ON" is entered to start processing traces, or "TRACE OFF" to discontinue trace processing. This procedure can be repeated as often as desired. The TPSM and the TSSM are the only GMC monitors that can be turned on or off while the GMC is physically executing.

5.2.9.2 Modifying the Transaction Processing System. To use the TPSM, the user must alter the Transaction Processing System. An alter file is provided with the GMF software delivery. The file name is B29IDPXO/SOURCE/TPEALT. This file contains all alters and associated JCL necessary to modify the standard TPS. These modifications apply only to the WW7.2 version of TPS. The user will need to make minor modifications to the file so as to correctly reference any permanent files that are required.

5.2.10 Timesharing Subsystem Monitor. The Timesharing Subsystem Monitor (TSSM) is used to measure TSS performance. Section 15 details those reports available from the data collected by this monitor.

When TSSM is active, GCOS trace type 74 (octal) must be enabled on the boot deck $ TRACE card. The TSSM causes the trace to be taken from many points in TS1; the collector builds its records which are then passed to the ER for buffering. An example of the record format appears in subsection 5.4.11. TSSM requires the following segment numbers from table 5-3 be used to generate the GMC R* file: 1, 10a, 11, 19, 23 and 36a. Subsection 5.6 shows how to generate an R* file.

If all TSSM reports are wanted, then both the CPU Monitor and Channel Monitor are additionally required: GCOS trace types (octal) 4, 7, 10, 11, 15, 21 and 22 must also be enabled. Restricting Channel Monitor activity to SNUMB TS1 will conserve tape and GMC overhead. The TSSM and TPSM cannot be run concurrently.

The TSS Monitor consists of two major pieces of software: a data generation program loaded into TSS and a data capture routine loaded along with GMC routines. The TSS Monitor is used to analyze periods of poor TSS response to determine which users are affected, when and for how long they are affected, and what the possible causes of the poor response are. To collect information for such analysis, probes are inserted throughout TSS to gather individual pieces of information which, when combined by a data reduction program, yield the desired result. When active, the TSS Monitor is an area of code entered via transfer instructions planted throughout TSS by an initialization routine. After the TSS Monitor is entered from a probe point, it makes an entry in the GCOS trace table and then returns to the TSS process which was executing. The places where transfers are made fall into the following categories:

- o Session identification and correlation - retrieval of line ID, DRUN, ID, USERID and User Status Table (UST) address (the unique identifier which is used to correlate traces coming from an individual session)

- o Type of user interaction - retrieval of subsystem names, indication of build mode, memory sizes, derail codes

- o Terminal I/O - a single location where I/O is started and a number of locations where courtesy calls for I/O complete are paid

- o Disk I/O to user files - a single location where I/O is started and a number of locations where courtesy calls are paid for I/O complete

- o FMS service - pairs of locations, one where TSS issues a request for service, and the other where the service is complete; the second location also gives an FMS status to tell whether the service was actually performed or why it was denied

- o Processor allocation - locations for entering the processor allocation process, placing an entry into the subdispatch ready queue, and removing an entry from the subdispatch fault queue

- o Memory allocation - retrieval of subsystem size; recording of the flow of control in the memory allocation and swap processes

- o Errors and denials - retrieval of numeric error codes, recording of individual denial events origin to be at location 3760 with respect to the beginning of TSSO. The first patch NOP's out a conditional transfer instruction around an instruction which loads a UST origin corresponding to the case when VIPs are configured. The letter "O" in these patches means that the patch locations are with respect to the origin of TSSO, not to slave address 0 of TSS as in the subsystem attribute patches. The letter "R" before patch content indicates that the address field of the patch must be relocated to the beginning of the module (TSSO) identified in column 7 of the patch. The symbolic addresses for these patches are IN7630+2 and IN7630+3. The following patches complete the TSS INIT file when the TSS Monitor is loaded on a startup file:

```
5271  OOCTAL   11007          DON'T TRANSFER IF NO VIPS      .MTIMS
5272  OOCTAL   R3760235007    ALLOW 1K FOR GMF               .MTIMS
```

5.2.10.3.3.4 Installation from a Permanent File. The principle of this method is that if a job has a file code ** active, any MME GECALL will cause that file to be searched before the system files are searched. Patches on the TSS INIT file must access a permanent file before subsystem loading begins and release it after subsystem loading finishes. The TSS User Derail Loader (TUDL, SDN K79005) provides an example of how to access and release a system loadable file from within the TSS executive. The patches on the TSS INIT file for the TSS Monitor are compatible with TUDL because TUDL starts its work after the TSS Monitor has finished its work. TUDL may further relocate the UST origin upward, but TUDL uses the address stored by the TSS Monitor patches. A list of an entire $ PATCH section is given in the TSSM source code. The first four patches match ones described in earlier sections.

The bulk of the patches used to access a permanent file are placed in an area of TSSO which is reserved for UST space when the UST origin is not adjusted upward (actually, this space was needed in releases prior to W7.2.0 to prevent the generation of a UST for TSR1 from destroying the code at the end of TSS startup; with the TSS INIT file feature, enough code intervenes so that this buffer is not necessary and so that the UST origin can be moved up and not destroy the code). The first transfer into these patches is at offset 4673 in TSSO (symbolic offset DMYERR+2, instruction EAX5 1). Here, the USERID in the file structure defined in the patches is stored into the SSA of TSS at location .SUID. Then a MME GEMORE accesses the file. Use of .SUID makes FMS think that the file is being accessed by its owner and thus, no special permissions are needed. If the MME GEMORE is denied, a flag is set to 0 before control returns to the original TSSO coding from offset 2013 in the patches.

The second transfer, at octal offset 5272 (symbolic location IN7630+3) replaces the instruction defining the UST origin. The patch at octal offset 5271 remains intact. In the second group of patches, the permanent file must be released, the number of PATs decremented by one, and the USERID in .SUID set to zero. If the GEMORE in the first set of patches is denied, then the number of PATs is not decremented. This alteration of word .SNPAT in the SSA is necessary because releasing the file does not remove the file code from the SSA. The patch for defining the new UST origin is moved to octal offset 2031 in the patches, just before a transfer back to TSSO.

5.2.10.4 Production Use of the Monitor. The following steps must be taken to enable data capture:

1. Append patches on file B29IDPXO/GMFCOL/TSS/TSS.PAT to Timesharing INIT File (normally OPNSUTIL/TS1).

2. Run the file B29IDPXO/GMFCOL/TSS/TSGMF to create the new TSS subsystem file.

3. Start TS1.

4. Start a copy of GMC with the TSS Monitor active.

5. Log on to a master USERID and enter "SYST GMF" at the "*" prompt following log-on to install the hooks into TSS code. Traces will not start at this time. The master USERIDs assembled in TSS are MASA and MASB. Unless these are patched or redefined in the TSS INIT file, only a terminal ID designated as master in .MSECR may be used for this step.

6. Enter "TS1 TRACE ON" from the system console to start generation of traces from TSS.

7. Enter "TS1 TRACE OFF" from the system console to suspend generation of traces.

Steps (5), (6) and (7) execute independently of (4); however, use of step (6) without use of step (4) will cause unnecessary TSS overhead if traces are being generated and lost due to GMC not being in execution. Steps (6) and (7) may be repeated multiple times if traces are to be captured for specific periods of the day. (The companion data reduction program, described in section 15 cannot process GMC sessions longer than 9 hours).

5.2.10.5 Monitor Limitations. To obviate lockup fault, initial trace generation (at "TS1 TRACE ON", and following lost data) is inhibited until the number of TSS users falls below 50. Further, all trace generation is inhibited until the number of users falls below 100. (The companion data reduction program is limited, by parameter, to 50 active USTs).

Whenever the dispatcher executes a trace after this point, the GMC ER will gain control and pass the system control over to the proper monitor for data collection. Control is then returned to the ER for return to the dispatcher.

In the process of collecting data, a monitor may desire to save a logical record on the collection tape. In order to sequence all logical records to the tape file, a common buffering system has been provided by the GMC. Any monitor can pass control to symbol BUFCTL for buffering a logical record to be saved on the tape file. This code is executed in master mode as an extension of the operating system function where control has been taken. Writing the buffered data to tape is a GMC slave function which requires controls between the buffering system and the writing system. The buffering system indicates, via software to the slave, when an individual buffer is to be written. After the slave has written the buffer, it is returned to the buffering system. The slave code for writing the tape is started at symbol BUFCHK. This slave portion is normally in GEWAKE mode and is awakened either by GMC master mode code or by a normal dispatch. The slave function will check for a full buffer and write it before going back to sleep. This process is repeated until GMC has been terminated, at which time the slave portion will execute the proper abort code via a MME GEBORT. The wrap-up procedure then performs all termination requirements. GMC will terminate via direction from the time option on the data card, limited reel option on the data card or else via console command. If no time option or limited reel option has been selected, the GMC will continue to process until it is ABORTED via the console.

At termination, the wrap-up location is given control and the termination record is processed. This is the slave termination of GMC. Also associated with termination is the return of the dispatcher code to its original state. This is accomplished by GMC checking its own .STATE word for a termination code. When the termination code is sensed, the dispatcher hook is removed, the original code is replaced, and the slave termination process is completed. Upon termination, ER reads the communication region table, writes the data to tape with a termination record, removes any patches it has placed in the system, and proceeds to wrap up.

5.3.2 Output. Output of GMC is always a magnetic tape file. The following is a guideline for the number of tapes generated by each monitor (800 BPI, 2400 feet tape reels):

- MUM - one tape every 6-8 hours. With Idle Monitor, one tape every 3 hours.
- MSM - one tape every hour

CPUM - 1 tape every 24 hours
TM - 1 tape every 24 hours
CM - 1 tape every half hour
TPSM - 1 tape every 4 hours
CAM - 1 tape every 8 hours
GRTM - 1 tape every 24 hours
TSSM - 1 tape every 2 hours

Analysis of this tape(s) is accomplished by a series of dedicated data reduction programs which are discussed in sections 6 through 12 and section 15. It is essential that the proper data reduction program is run against data created by its associated monitor routine.

The GMC is usually terminated by operator request. However, there are times when the monitor may terminate itself. In most of these cases, the operator will receive a console message indicating the reason for the abort (see table 5-2). However, under some circumstances the message the operator sees is that GMC terminated with "NO REASON SPECIFIED." In this case, if the job listing is examined, a reason will be given under the WRAPUP activity information as shown below.

```
* ACTY-01 $ CARD #0008* GELOAD  03/16/78  SW=000000000000
NO REASON SPECIFIED        AT 030440 I=5060 SW=000000000000

*WRAPUP BEGUN
(USERS BS MME GEBORT)      AT 031413 I=0000 SW=000000000000
```

5.4 GMC Data Records

5.4.1 GMC Executive. The GMC Executive produces an initialization record that must be read by every data reduction program. This record contains information on the system configuration and the status of various queues at the time the monitor started. The length of the record is dependent on the size of the configuration. The Executive also writes a termination record whenever it terminates normally.

Initialization Record

Word	Bits	Information
1	0-35	Block Control
2	0-35	Zero
3	0-17	Year (.CRJCD)
	18-35	Julian day (.CRJCD)
4	Not used	
5	0-35	Current date (.CRDAT)
6	0-35	Current time (.CRTOD)
7	0-35	Reg A of RSCR 32

CC	
1	
MO M3	Turn off Monitor 0 and 3
M1	Turn off Monitor 1
M1 M9	Turn off Monitor 1 and collect only a single reel
M1 *12.36,05.00	Turn off Monitor 1, start collecting data at 12.36, and collect for 5 hours
*,03.00	All Monitors are present on the R* file and are active, collection is to start at once and continue for 3 hours
+CK	All Monitors are present on the R* file, and communication traffic is to be monitored for terminal CK
M1 M4 M93	Turn off Monitors 1 and 4, and collect maximum of three reels of data
M*	Suppress abort if GMC cannot move
#VIDEO,HEALS	All Monitors are present on the R* file, and accumulate processor time in the CPU Monitor for these SNUMBs.
MO M5 M8 ?1	Turn off monitors 0, 5, and 8. Collect only tape connects with the MSM and CM.
MO M2 M5 M; X MS2755TRTOS	Turn off monitors 0,2,5, set tape density to 1600 BPI, read second data card, turn on MSM/CM special SNUMB option to include TSS, FTS, $PALC, 2755T and RTOS.
MO M4 M; MS	Turn off monitors 0,4, set tape density to 1600 BPI and collect MSM/CM traces for only TSS, FTS, $PALC.

Figure 5-3. Data Card Examples

(3) Requesting complete communication data for 1 or 2 terminal IDs.

(4) Suppressing a GMC abort if it cannot move to an acceptable location.

(5) Specifying up to three SNUMBS to be processed by the CPU Monitor.

(6) Requesting that only tape connects or mass storage connects be collected, but not both. The default is to collect both types.

(7) Declaring the start and stop times of monitoring.

(8) Requesting high density tape be collected.

(9) Specifying that the Mass Store Monitor and/or Channel Monitor are to collect data only for certain jobs.

(10) Specifying that the data card options are continuing on a new card.

(11) Specifying the monitoring requirements for the GRTM.

5.5.1 On/Off Option. This option allows the user to turn off all monitors not required for his purposes. Since the GMC default is to have all monitors turned on, unless specifically turned off, and since the TSS and TPE Monitors are incompatible, the user must have a data card and at least one of these two monitors must be turned off. The code format to turn off a given monitor is:

M0 = Memory Utilization
M1 = Mass Store Monitor
M2 = CPU Monitor
M3 = Tape Monitor
M4 = Channel Monitor
M5 = Communications Monitor
M6 = GRTS Monitor
M7 = TPE Monitor
M8 = Idle Monitor
MA = TSS Monitor
MB-MF = User Developed Monitors

(See Section 13 for a discussion of user developed monitors.)

CAUTION: The TPE Monitor and the TSS Monitor are incompatible and cannot be active at the same time.

Table 6-1. (Part 2 of 4)

ID Number	Histogram Title
21	Number of Activities Waiting Memory When a Processor Went Idle *
22	Memory Available When a Processor Went Idle *
23	Delay Time in the System Scheduler
24	Delay Time Until Core Allocation
25	Percent of Assigned Memory Used (Time-Corrected)
29	Number of User Activities Waiting Memory in the Allocator Queue *
30	Number of User Activites in Memory *
31	Elapsed Time of a Busy State Processor 0
32	Elapsed Time of a Busy State Processor 1
33	Elapsed Time of a Busy State Processor 2
34	Elapsed Time of a Busy State Processor 3
35	CP Time Per User Activity
36	I/O Time Per User Activity
40	Number of Activities Waiting Memory (Time-Corrected) *
41	Number of Activities in Memory (Time-Corrected) *
42	Memory Available (Time-Corrected) *
43	Number of User Activities Waiting Memory (Time-Corrected) *
44	Number of User Activities in Memory (Time-Corrected) *
45	Total Demand Outstanding (Time-Corrected) *

* Jobs with 0 urgency are not included.

Table 6-1. (Part 3 of 4)

ID Number	Histogram Title
46	Number of Extra Activites That Could Fit in Memory Without Compaction
48	Length of an Idle State (All Processors)
49	Length of an Idle State Processor 0
50	Length of an Idle State Processor 1
51	Length of an Idle State Processor 2
52	Length of an Idle State Processor 3
53	Number of Times System Activity Swapped
54	Elapsed Time a System Activity was Swapped
55	Elapsed Time of a Busy State Processor 4
56	Elapsed Time of a Busy State Processor 5
57	Length of an Idle State Processor 4
58	Length of an Idle State Processor 5

ID Number/Name	Plot Title
26/PLOT1	Availability of Memory vs. Outstanding Demand In Core Allocator Queue vs. Outstanding Demand in Peripheral Allocator Queue Plus Outstanding Demand in Core Allocator Queue
27/PLOT2	Memory Shortfall in Core Allocator Queue vs. Memory Shortfall in Core Allocator Queue Plus Memory Shortfall in Peripheral Allocator Queue
28/PLOT3	Number of Activities in Core Allocator Queue vs. Number of Activities in Peripheral Allocator Queue
59/PLOT4	Average size of TSS, FTS and NCP

cover a larger range of values. This change could be made via data cards and would not increase the size of the program.

The second method would involve increasing the size of the histogram by altering the value of TABSIZ. As long as the size requested does not exceed 50, this change can also be done via a data card. However, if an individual histogram needs to be larger than 50 buckets, the user will need to change the value of MXTBSZ. This change will require a change to source code, a recompile, and probably, an increase in program size. All references to MXTBSZ must be altered. This would need to be done in the EDIT subsystem of Time-Sharing.

The remaining items that can be modified are the title and the vertical axis headers. Table 6-2 shows the default values for all histograms.

6.1.4 Plot Options. There are three characteristics directly available to the user for each individual plot axis used.

The first characteristic, MAXNUM, is the maximum number of entries to be plotted on each vertical plot axis.

The second characteristic, YMAX, defines the upper limit of the horizontal display axis.

The third characteristic, YMIN, defines the lower limit of the horizontal display axis. Table 6-3 shows the default values for all plots.

6.1.5 Default Option Alteration. The general format for an option request is as follows: The first card contains an action code describing the action to be taken. Subsequent cards modify report parameters for some of the action codes. All input cards are free format with the only requirement being that at least one blank space separates multiple input parameters. The very last input card must have the word "END" typed on it. This card must be present whether or not any other input options are selected. Available actions with their (default) implications are shown in table 6-4. There is no order required for the options. In reading the following sections it should be remembered that the first card for any input option must be the action code specification with no other data present on the card.

The user should take special note that if this software is executed under a WW6.4/2H GCOS release, an additional data card is required. This data card is not described elsewhere in this chapter. The data card should contain the letters RN.

Table 6-2. Default Values for Histograms (Part 1 of 2)

ID #	Low Value	Interval Size	Number of Buckets
1	4	4	50
2	0	50	50
3	0	250	50
4	0	1	50
5	4	4	50
6	0	1	50
7	0	5	50
8	0	200	50
9	0	200	50
10	.95	.1	50
11	4	4	50
12	0	10	50
13	0	1	50
14	0	1	50
15	0	1	50
16	0.0	5.0	50
17	0	10	50
18	4	10	50
19	4	20	50
20	0	1	50
21	0	1	50
22	4	8	50
23	0	25	50
24	0	25	50
25	50	2	50
29	0	1	50
30	0	1	50
31	0.0	5.0	50
32	0.0	5.0	50
33	0.0	5.0	50
34	0.0	5.0	50
35	5	5	50
36	5	5	50
40	0	1	50
41	0	1	50
42	0	10	50
43	0	1	50
44	0	1	50
45	0	10	50
46	0	1	50
48	0.0	5.0	50
49	0.0	5.0	50
50	0.0	5.0	50

Table 6-2. Default Values for Histograms (Part 2 of 2)

ID #	Low Value	Interval Size	Number of Buckets
51	0.0	5.0	50
52	0.0	5.0	50
53	0	1	50
54	0	250	50
55	0.0	5.0	50
56	0.0	5.0	50
57	0.0	5.0	50
58	0.0	5.0	50

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Table 6-3. Default Values for Plots

ID #	Max Size of Plot	Lower Plot Limit	Upper Plot Limit
26	Unlimited	0.	456.
27	Unlimited	0.	456.
28	Unlimited	0.	114.
59	Unlimited	0.	228.

Table 6-4. Available Report Actions and Their (Default) Values (Part 1 of 2)

HISTG - Modify a histogram (see table 6-2)

PLOT - Modify a Plot (see table 6-3)

ON - Turn a specific report on - (all reports on except Memory Map and Out of Core Report)

OFF - Turn a specific report off - (all reports on except Memory Map and Out of Core Report)

TIME - Set a timespan(s) for reporting - (total time reported)

ALLOFF - Turn all reports off except those specified - (all reports on except Memory Map and Out of Core Report)

ALLON - Turn all reports on except those specified - (all reports on except Memory Map and Out of Core Report)

ERROR - Do not stop on an option request error - (stop on an input error)

DEBUG - Program debug requested - (no debug)

ALLOC - Stop program after a specified number of memory allocations have been requested - (entire tape processed)

NREC - Stop program after a specified number of tape records have been processed - (entire tape processed)

NOUSER - Do not print USERID on any report - (USERID printed on certain reports)

IDLE - Turn off all Idle Monitor reports - (all IDLE reports on)

WASTED,CORE,IO,CPU,RATIO,URG - Changes parameters used in the Excessive Resource Usage Report - (20K,50K,30MIN, 30MIN,5,40)

ABORT - SNUMBs not to report in the ABORT Report - (all SNUMBs that abort are reported)

PLTINT - Change Interval at which plots are printed - (10 MIN)

FSTSLV - Change the lowest allowable user program number - (14 decimal)

MASTER - Define SNUMBs that are considered to be SYSTEM jobs - (all programs with a program number less than FSTSLV) must be expressed as four character fields with no intervening blanks. Time is based on a 24-hour clock. If a user wants to request the time 4:07, he must input 0407. All times must include four characters.

If a start time, but no stop time, is desired, no characters should be entered after the minutes of the start time. If a stop time is requested, there must be a start time corresponding to it. If the user wants to start at the beginning of data collection and stop at some specified time, but is not sure of the start time, a start time of 0001 should be used. Figure 6-5 shows the format for this option.

6.1.11 Turn All Reports Off Except Those Specified (Action Code ALLOFF). All reports except those explicitly identified here are to be turned off. The inputs consist of

A B C . . . Y (max of 25)

where A through Y are the report ID numbers (table 6-1) to be turned on. The format is shown in figure 6-6. This option will control the printing of all reports, including histograms if they contain a specific ID number.

6.1.12 Turn All Reports On Except Those Specified (Action Code ALLON). All reports except those explicitly identified here are to be turned on. The input consists of

A B C . . . Y (max of 25)

A through Y are the report ID numbers (table 6-1) to be turned off. The format is the same as action code ALLOFF (see figure 6-6). This option will control the printing of all reports, including histograms if they contain a specific ID number.

6.1.13 Continue Data Reduction After an Input Option Error (Action Code ERROR). This code allows data reduction to continue when an error has been detected and reported in an input option request. The default value will abort data reduction and report the error. Only the Action Code card is required.

6.1.14 Debug For a Given Program Number (Action Code DEBUG). This is a debug option which supplies large amounts of output for a given program number. It should be used only in cases of data reduction problems. Card 1 contains the word DEBUG and card 2 contains a program number. A program number of -150 will provide detailed debug on system scheduler activities.

6.1.15 Stop After a Specified Number of Tape Records Processed (Action Code NREC). This option is useful when a tape problem occurs and the entire tape cannot be processed. When this occurs, the program will usually abort with an I/O error and some reports might be lost. If a tape error does occur during data reduction, the operator should type a "U" in response to the operator action request made by GCOS in processing tape errors. If the operator performs this action, the data reduction program will abort gracefully.

Unfortunately, there are times when a tape error will cause a program abort without giving the operator a chance to respond with a "U". In these cases reports will be lost and this option will need to be used

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```
Card  1   A
      2   N M
      3   B C D E ...
```

where
A = The word TIME
N = Report ID name to be time spanned (table 6-1)
M = Number of different times appearing on Card 3
B,C,D,E = Start and stop times used to define the time spans.
          Times must be separated by one or more blanks.

Figure 6-5. TIME Action Code Format

6.1.21 Change the Program Number for the First Slave Job (Action Code FSTSLV). In the GCOS system, certain program numbers are assigned to system jobs. For example $CALC is program number 1, $PALC is program number 2, $SYOT is program number 3, etc. In the WWMCCS system, all programs with a program number less than 14 (decimal) are considered system programs. This option allows the user to alter this program number from its default value of 14. The first card contains the word FSTSLV and the second card contains the new program number. For non-WWMCCS systems, FSTSLV should normally be set to 10.

6.1.22 Request that Certain Jobs be Considered System Jobs (Action Code MASTER). There are certain jobs executed during the course of a day which have program numbers that would designate these jobs as user jobs. However, in actuality they are system jobs and should be considered as system overhead. Examples of such jobs are VIDEO, HEALS, the GMF MONITOR, etc. This option allows the user to define up to ten jobs that should be considered as system jobs. The first card contains the Action Code MASTER. The second card contains the number of jobs to be defined as system jobs. The third card contains the SNUMB of each job to be considered as a system program. Each SNUMB must be followed by at least one blank column.

6.1.23 PALC Report Print Control (Action Code PALC). Due to the excessive amount of output possible from the PALC report, a time control can be set to print only those activities that are in any PALC state greater than the time limit. This time limit defaults to 600 seconds (10 minutes). The first card contains the word PALC and the second card contains the new time limit, in seconds.

6.1.24 Request the Special Job Memory Reports (Action Code SPECL). If the analyst desires to track the memory demands for a specified number of jobs (not to exceed ten), this input option should be invoked. This option will cause two reports to be produced. One report will indicate every time the requested job(s) was swapped or issued a MME GEMORE/GEMREL for memory, how long it was swapped, or how long the GEMORE was outstanding, and how much memory the job(s) required. In addition, every time the special job issues a MME GEMORE, a line from the Memory Map Report will be generated. This line is generated by default and is not dependent upon whether or not the Memory Map Report is enabled. When the analyst wants to match the Memory Map output to the Special Job output, he must do so based on the time value. For example, if the Special Job Report indicates that FTS issued a MME GEMORE at 16.81057, the user would then examine the Memory Map for a line of output with a time smaller than 16.81057, but where the time on the next line is greater than or equal to 16.81057. For example, the Memory Map might have a line of output with a time indication of 16.81052 where the next line of output was 16.81065. In this case, the line of output at 16.81052 shows what memory looked like at the instant in time that FTS issued the MME GEMORE. If the Special Job

Report indicates that FTS was swapped after issuing the MME GEMORE, the analyst could examine the Memory Map in order to determine why FTS was forced to swap.

A line of the Memory Map is also generated every time the GEMORE for the special job was denied or the special job was forced to swap in order for the GEMORE to be satisfied. This line of the Memory Map would show what memory looked like when the special job was denied the memory request or was swapped from memory. A final line of the Memory Map is produced whenever the special job's memory demand was met. For the swap/denied case and the memory-met case, the Special Job Report and Memory Map are matched by locating identical time values on each report. By generating the Memory Map, the analyst can determine if there are certain jobs that are preventing other jobs from acquiring required memory resources. In this case, the Special Job Report and Memory Map Report can be correlated by matching up the time values from both reports with the identical time values. This is especially useful in an analysis of the Timesharing Subsystem or the File Transfer System.

A second report will also be produced which indicates the average memory size of the job(s) during the course of its execution. This average is taken over increments of time where the time increment used, is the same increment that is used to produce the series of plots. The option consists of three cards where the first card contains the word SPECL, the second contains the number of jobs to be analyzed, and the third card contains the list of SNUMBs separated by at least one blank column.

6.1.25 Process Data on a WW6.4 System (Action Code RN). If the data reduction program is to be run on a WW6.4 system, the user must use this input option. It consists of the letters RN typed on a data card.

6.1.26 Produce a Memory Map Only Under Certain Memory Demand Conditions (Action Code MAPART). Due to the enormous amount of output generated by the Memory Map and Out of Core Reports, it is suggested that a site not produce these reports as a standard procedure. However, these reports are very useful in that they do provide a complete picture of memory as well as a total list of all jobs waiting for memory. In order to provide an analyst with the capability of obtaining these reports, without being buried in computer output, this new option has been designed. When used, this option states that a line of the Memory Map and Out of Core Reports should be generated only when the number of activities waiting for memory surpasses a certain limit. To invoke this option, a two-card format is required. Card 1 contains the word MAPART and card 2 contains the number of activities that must be waiting memory before a line of output will be generated for the Memory Map and Out of Core Reports.

Table 6-5 shows all the MUDRP file codes and their corresponding reports.

6.3 Outputs

In this section, a simple explanation of how each report was derived from the data is given. Subsection 6.1 discussed how the ranges and other options of each report may be modified to fit an individual installation. While this section will provide some insight as to how an analyst should proceed to review all the reports produced by the MUDRP, section 14 provides a step-by-step approach as to how a memory analysis might be conducted.

Immediately prior to the output of the histograms, the user will find a printout containing processing information. Included in this information is the following:

- o Printout of all input options selected by user
- o Indication of multireel tapes that are being requested and have been mounted
- o Indication of the monitors that were active during data collection
- o Error messages - all error messages are either self-explanatory or else followed by the words "For Information Only." The latter messages are used by CCTC for future enhancements and as such can be ignored by the user.
- o If the time frame option was used, and indication of when the various time frames were reached.

6.3.1 MUM Title Page. The Memory Utilization Monitor (MUM) title page contains a summary of the systems configuration and activity over the measurement period (see figure 6-9). It displays the time the monitor was initiated and terminated, as well as identifying the system which was monitored and the tape number(s) containing the data. The configuration information is augmented by the amount of memory dedicated to the operating system itself, including that used by the memory allocation program. These figures will give the user a good idea of how much hard core space remains and could be used for SSA module hard core loading. If SSA cache is also configured, the amount of memory being used for this feature is also listed. The version number should be 01-82.

Immediately following is a summary of the work processed over the measurement period. The first set of lines provides information concerning the overhead generated by the actual data collection. The monitor name is given, its CPU time in seconds, an its overhead as a function of total processor power. The GMF executive overhead is separated from the actual monitors and is listed as "EXEC". The monitor "NAME" is an area of code within the Mass Store Monitor and even though

Table 6-5. File Code for MUM Reports
(Part 1 of 2)

20	Activity Resource Report, Special Job Reports
21	IDENT Report
22	Special Job Report (temporary file)
23	Special Job Report (temporary file)
24	Urgency Over Time Report (temporary file)
26	Zero Urgency Job Report (temporary file)
27	Activity Abort Report
31	Plot 1 - (see table 6-1 for Plot Definition) (temporary file)
32	Plot 2 - (see table 6-1 for Plot Definition) (temporary file)
33	Plot 3 - (see table 6-1 for Plot Definition) (temporary file)
34	Excessive Resource Report
35	Plot 4 - (see table 6-1 for Plot Definition) (temporary file)
36	Used for outputting all plots
37	Used for outputting Out of Core Report, Memory Map, and Peripheral Allocator Report
42	Histograms, System Program Usage Report, Memory Statistics Report, Distribution of Urgency Over Time Report, Zero Urgency Job Report
45	Out of Core Report (temporary file)
51	Memory Map Report with one file required for each 128K Memory configured (temporary file)
52	Memory Map Report with one file required for each 128K Memory configured. (temporary file)
53	Memory Map Report with one file required for each 128K Memory configured (temporary file)
54	Memory Map Report with one file required for each 128K Memory configured (temporary file)

```
****** T H E   M E M O R Y   U T I L I Z A T I O N   M O N I T O R ******
                              VERSION 01-82

MONITORING ON 79-05-04 STARTED AT 11:39:50 AND COMPLETED AT 13:19:56 FOR A TOTAL TIME OF 1.67 HOURS
                       ON SYSTEM OSCC2  RUNNING 6.4.1D OF TAPE D0002

                         THE SYSTEMS CONFIGURATION CONSISTED OF:

                                2 - 6680 CENTRAL PROCESSORS
                                2 - INPUT/OUTPUT MULTIPLEXORS
                                    WITH 24 I/O CHANNELS
                              512 - 1024 WORD BLOCKS OF MEMORY
                               52 OF WHICH WERE USED BY THE HARD CORE SYSTEM ITSELF
                                3 OF WHICH WAS USED BY CALC
                               5K USED BY SSA CACHE (NOT HARD CORE)

                THE SYSTEM PROCESSED THE FOLLOWING OVER THE MEASUREMENT SESSION:

                    MONITOR        TIME(SECS)        % OVERHEAD
                     EXEC             100               1.7
                     MUM               60               1.0
                     CPU               40                .7
                     IDLE              40                .7
                     TOTAL                              4.1

                            175 ACTIVITIES WERE PROCESSED     AT A RATE/HOUR OF  104.89
                                OF THESE 50 WERE SYSTEM SCHEDULAR ACTS
                            125 ACTUAL ACTIVITIES WERE PROCESSED AT A RATE/HOUR OF 74.85

                            128 MOVES WERE PERFORMED          AT A RATE/HOUR OF   76.72
                            266 SWAPS WERE PERFORMED          AT A RATE/HOUR OF  159.44
                         201466 TIMES THE PROCESSORS WENT IDLE YIELDING A
                             20 % IDLENESS OF THE PROCESSORS
            THE FIRST  PROCESSOR WENT IDLE 122479 TIMES, YIELDING 23 % IDLENESS
            THE SECOND PROCESSOR WENT IDLE  78987 TIMES, YIELDING 17 % IDLENESS

      THE MEMORY ALLOCATOR WAS CALLED     1907 TIMES -      0 OF WHICH RESULTED IN NO STATE CHANGE

   THE TOTAL CPU TIME IN SECS WAS   6991   THE TOTAL IO TIME IN SECS WAS   15662   CPU/IO RATIO IS  0.446373
            WEIGHTED MEMORY SURPLUS IN K WORDS WAS     46
            WEIGHTED MEMORY SHORT-FALL IN K WORDS WAS 50 INCLUDES CALC AND PALC QUEUES
```

Figure 6-9. MUM Title Page Report - Idle Monitor Active listed separately it is also included under the monitor "MSM". The Monitor "FMS" is also an area of code within the Mass Store Monitor, but in this case it has not been included under the monitor "MSM". These two special areas of code, within subroutine T7 (connect trace processing), are considered to be high usage areas and as such consume significant processing resources. In order to determine the true overhead of these areas, so that future code optimization can be considered, these areas are being reported separately.

Monitor "CM" in this report describes the processor overhead of subroutine T4 (terminate processing) and subroutine T22 (start I/O processing). Monitor "MSM" in this report describes the processor overhead of subroutine T7 (connect processing). Therefore, if the Channel Monitor was active, but the Mass Store Monitor was not, this report will still list both "CM" and "MSM" as contributing to the processor overhead. The total Channel Monitor overhead will be found by adding the overhead of the "CM" monitor, to the overhead of the "MSM" monitor, to the overhead of the "FMS" monitor.

If both the Channel Monitor and Mass Store Monitor were active, then the combined overhead of both monitors can be found as the sum of "MSM" + "CM" + "FMS".

For purposes of this report, % overhead is computed as

$$\frac{\text{(CPUTIME used by monitor)}}{\text{(Total Elapsed Time)} \times \text{(number of Processors)}}$$

Following this are several lines describing the work performed during the monitoring session. These lines are self-explanatory.

If a termination record is not processed, either because the monitor aborted before a termination record could be written or else time frames were used, the lines describing GMC overhead will not be printed.

The number of times a processor went idle is derived from the idle processor traces captured by the IDLEM, with the percentage of processor idle also being gathered by the collection of idle state information. This is shown system-wide (i.e., for all the central processors and then individually for each processor). This information will not be present if the IDLEM was not active or if its output reports have been disabled by a data card option (see figure 6-10).

The number of memory allocator calls, as counted by the monitor, is shown. This much less than the number of calls to the multitude off SSA modules used by the Core Allocator and consists only of those that may have altered the memory state of the system. The second figure shows how many times a memory state change might have taken place and did not. This could be caused by no allocation being possible or by a call to the allocator pertaining to a matter other than allocation (i.e., a console message).

6.3.3.20 Report 20 - The Elapsed Duration of User Activity in 10ths of a Second. This report presents the clock time that the allocator knew of a suer activity's existence, measured from its first memory demand to its termination. This includes all time spent in a GEWAKE, in memory, and swapped.

For this report, an entry is made for each user activity that terminates. See report 10 for an explanation of user vs. system activities.

6.3.3.21 Report 21 - The Total Elapsed Time a User Activity Was in Memory. This report shows the duration of elapsed clock time each user activity had memory allocated to it. It helps describe the system workload requirements.

For this report, an entry is made for each user activity that terminates. See report 10 for an explanation of user vs. system activities.

6.3.3.22 Report 22 - The GEMORE Service or Denial Time - 1/10 Second, Elapsed. The time from a GEMORE request until the activity is allocated the extra memory, swapped to achieve the aditional memory, or denied the memory is displayed in this report.

For this report, an entry is made for each activity whose GEMORE request is not longer present.

6.3.3.23 Report 23 - The Request Size of GEMOREs. All GEMORE requests are shown in this report with the displayed size in 1K blocks.

For this report, an entry is made for each GEMORE request.

6.3.3.24 Report 24 - Delay Time in the System Scheduler. The amount of time a job spends in one of the scheduler queues is displayed in this report. The Allocation Status Report can be used to display particular jobs that are delayed for excessive amounts of time.

6.3.3.25 Report 25 - Delay Time Until Core Allocation. This report displays the total amount of time activities spent in the various allocation phases prior to core allocation. The Allocation Status Report can be used to display particular activities that are delayed for excessive periods of time.

6.3.3.26 Reports 26 through 31 - The Elapsed Time of a Busy State of the Processors. These reports present the elapsed clock time between the idle states of each individual processor. The reports supply an indication of how each processor is utilized versus the others in the system.

For these reports, an entry is made at each idle state of a processor. IDLEM data is used to produce these reports. These reports will not be produced if the IDLEM was not active or if the IDLEM reports have been disabled by user input option.

6.3.3.27 Report 32 - The Elapsed Time of a Busy State of Processors. The elapsed clock time between idle states of all processors is presented in this report.

For this report, an entry is made for each processor idle state. IDLEM data is used to produce this report.

6.3.3.28 Report 33 - Elapsed Time Between Allocator Calls in 1/100 of a Second. This report shows the elapsed clock time between calls to the allocator and shows if the allocator is receiving sufficient service.

For this report, an entry is made for each user activity that terminates.

6.3.3.29 Report 34 - The I/O Time Charged per User Activity in Seconds. This report indicates the I/O time charged to each user activity.

For this report, an entry is made for each user activity that terminates.

6.3.3.30 Report 35 - The CP Time Charged per User Activity in Seconds. This report presents the CP time charged to each user activity. For this report, an entry is made for each user activity that terminates.

Reports 34 and 35 report the total CPU and I/O times used by a user activity while the monitor was active. These histograms are not generated for programs with program numbers less than 14 (i.e., system programs). See report 10 for additional user options in defining system activities and user activities.

6.3.3.31 Report 36 - The Number of Times a User Activity was Swapped. This report shows the swap count per user activity. The total number of swaps a user activity incurs is the user argument, as counted by the monitor. See report 10 for additional user options in defining system activities and user activities.

For this report, an entry is made for each user activity that terminates.

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Figure 6-14.

6.3.3.32 Report 37 - The Total Elapsed Time a User Activity Was Swapped. This report indicates the total time a user activity was inactive due to a swap. After each swap is completed, an accumulator is updated, and if an activity is terminated, an entry is made to this report. See Report 10 for additional user options in defining system activities and user activities.

6.3.3.33 Report 38 - The Number of Times a System Activity Was Swapped. This report is the same as Report 34 except for system activities. See Report 10 for additional user options in defining system activities and user activities.

6.3.3.34 Report 39 - The Total Elapsed Time a System Activity Was Swapped. This report is the same as Report 35 except for system activities. See Report 10 for additional user options in defining system activities and user activities.

6.3.3.35 Report 40 - Number of Extra Activities That Might Fit in Memory Using Compaction. This report shows how memory might have been used more optimally. It takes the total amount of available memory (displayed in Report 5) and attempts to fit in those activities waiting memory. If an activity fits, the memory available is decreased, and the next activity is tried. If an activity does not fully fit, the next activity is tried. This continues until all available memory is used or until all the activities waiting have been tried. The search starts at the first waiting program and progresses serially down the program numbers of those waiting. This search ignores the actual size of "holes" or quadrant-crossing and is not necessarily obtainable or optimal. For this report, an entry is made at each allocator call.

6.3.3.36 Report 41 - Number of Extra Activities That Might Fit Memory Without Compaction. This report is the same type as Report 40. In this case, activities are fit into existing holes and are ordered by urgency. The search progresses down the activities serially, beginning at the highest urgency activity. This histogram presents a good picture of how well the core allocator is performing its function.

For this report, an entry is made at each allocator call.

6.3.3.37 Report 42 - The Percent of Size-Time Product Used by a User Activity. This report shows the percentage of user each activities' size-time product over its run-time duration. An entry is made for each user activity that terminates. See Report 10 for an explanation of user and system activities.

6.3.3.38 Report 43 through 49 - The Length of Idle State in the Processors. The elapsed clock time of an idle state is given in these reports for each individual processor and also as an average for all processors. They supply an indication of how each processor was utilized versus the others in the system. They also provide information on how busy the processors are. These reports should be used in conjunction with Reports 26 through 32.

statement that the $LIMITS card appears to be requesting more memory than is actually required by this job. The user should be questioned in order to determine if this is in fact true. In the Honeywell System, a user will receive whatever amount of memory requested on the $LIMITS card, whether or not the amount of memory is actually needed. The Ratio column shows the ratio of the total elapsed time for an activity divided by the total memory time for the activity. This value gives an indication of the activity lengthening factor; i.e., how run time is affected by resource contention. For those activities using excessive memory, the report also indicates, under the MEM MIN column, the amount of time the activity was in memory. The value being used for the urgency check is the average urgency recorded for the activity and not the maximum urgency of the activity. The default values for an entry being made to this report are listed in table 6-4. These values can be changed via a previously described input option. This report will be produced whenever the Activity Resource Report is produced and will be turned off whenever the Activity Resource Report is off (see figure 6-21).

6.3.11 Allocation Status Report. This report will track an activity as it proceeds through different phases of Allocation. The report will list the SNUMB-Activity #, amount of memory the activity will require, its current status, the time it entered that phase of allocation, the time is completed that phase of allocation, the total time spend in a given phase of allocation, the device type it is waiting for, and the number of devices the activity is waiting for. Due to the manner in which data is collected for this report, it is possible that certain phases of allocation will be missed, especially if that phase of allocation occurs within a short time span. This report will give a good indication of how long it is taking activities to pass through the various allocation phases prior to core allocation. Following is a list of the more common phases of allocation and their meanings:

- New Act - Activity has just entered the Peripheral Allocator
- Wait Media - Activity is waiting for a device
- Wait Mnt - Activity is waiting for a patch or tape to be mounted
- Core Queue Full - Activity has been completely processed and is waiting for the Peripheral Allocator to send the job to the core allocator
- Alloc Done - Activity has been sent to core allocator. For this case the stop time and total time columns have no real meaning. These columns simple are reporting the amount of time it took the monitor to realize that the activity had reached the core allocator
- LIMBO - Activity is in Limbo and has not even been granted permission to run
- HOLD - Activity is in Hold and has not even been given permission to run
- SCHED - Activity was in one of the System Scheduler queues.

Only activities found to be in a state for more than 600 seconds will be reported. This limit can be changed by using the PALC input option. See figure 6-22 for a sample of this report.

6.3.12 Plot Reports. Three different plot reports are produced by the data reduction program. All plots are produced under 10-minute intervals, where the interval can be modified by the user. At every allocator call, the various parameters to the plots are accumulated and every 10 minutes, the accumulated parameters are averaged and an average value is output

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EXCESSIVE RESOURCE USAGE REPORT ON SYSTEM DNAH66 ON 81-12-17 AT TIME 10:01

SNUMB-ACT	WASTED MEMORY	MEM USED	IO SECS	CPU SECS	RATIO	MEM MIN	MAX URG	USERID	IDENT
2027Q- 1		56				1.2		FCCCSE	1020,WA024,CSE,250,MCCANN,SECRET
2044T- 1		81				2.8		FCCCSE	1010,WA803,CSE,264,UARRETT,UNCL
2057T- 1		64				3.4	47	FCCCSD	1010,NS0033,CSD,283,PADILLA,UNCL
2083Q- 1		56				1.0		FCCCSE	1020,WA024,CSE,250,MCCANN,SECRT
2085T- 1		92				5.0	55	DBA	1020,TRAX.A,CSA,254,MATHEWS,SECRET
2106T- 1		81				2.7		FCCCSE	1010,WA803,CSE,264,BARRETT,UNCL
SR01 - 5		65				0.6		FCCCS	1030,SR01,CSC,250,MCCANN,TOPSEC

Figure 6-21. Excessive Resource Usage Report

ALLOCATION STATUS REPORT

SNUMB	MEMORY	STATUS	TIME IN	TIME OUT	TOTAL TIME(SEC)	DEVICE TYPE	NUMBER
7338T- 1	10	WAIT MNT	12:42	12:52	600.		
7338T- 4	51	CORE QUE FULL	12:46	12:57	660.		
29675- 2	36	WAIT MEDIA	12:49	13:00	660.	DSS191	2

Figure 6-22. Allocation Status Report

to the plot. Each horizontal position has a delta value, which is printed on the plot. The delta value is computed from the following formula:

$$\frac{\text{(Upper Plot Limit - Lower Plot Limit)}}{114}$$

The plot limits can be set by the user, with the default values shown in table 6-3. If the user changes the maximum limits, the new maximum limit selected should be divisible by 114. If a plotted variable is beyond or on an axis limit, it will be positioned at the axis limit. If any 2 points coincide, the position of coincidence will be marked with a 2. If 3 points coincide, the position of coincidence will be marked with a 3. (See figure 6-23). The end of the plot will contain a summary of the minimum and maximum values of each curve.

In figure 6-23, we see that there was no memory shortfall at all between 12:49 and 14:09 (points A & B are coinciding with the left axis; i.e., a 2 is output). At 14:19 and 14:29, both curves continue to coincide, but there is now a shortfall of 48K (12th point times delta of 4). At 14:39, the memory shortfall of the CALC increased to 92K but the memory shortfall of the CALC plus the PALC queue increased to 116K.

In order to obtain a continuous curve from the plots, the user needs only to connect the corresponding letter points (see figure 6-23).

6.3.12.1 Plot 1 - Available Memory vs. Outstanding Demand in Core Allocator Queue vs. Outstanding Demand in Core Allocator Queue + Peripheral Allocator Queue. This three parameter plot provides an overview of the time dependence of both the system load and memory availability. It can aid in better balancing the workload across the day and in determining when memory shortfalls or supluses exist. The addition of memory demand waiting in the Peripheral Allocator is an attempt to give a truer picture of how much additional memory could be properly utilized, if available. As long as the B and C points fall to the left of the A points, a memory surplus exists. If the B and C points fall to the right of the A points, a memory shortfall is present.

6.3.12.2 Plot 2 - Memory Shortfall in Core Allocator vs. Memory Shortfall in Core Allocator + Peripheral Allocator. This plot is obtained from the previous plot by simply calculating the actual shortfall and plotting the shortfall points.

6.3.12.3 Plot 3 - Number of Activities in Core Queue vs. Number of Activities in Peripheral Allocator Queue. In this plot, the number of activities waiting for memory is displayed, instead of their memory demand.

6.3.12.4 Plot 4 - Average Size of TSS, FTS, NCP. This plot displays the average size of TSS, FTS and NCP as they change their demand for memory over time. These three programs are those whose memory demand would significantly change over time. The FTS and NCP programs are part of the WIN subsystem.

MEMORY STATISTICS TABLE (DHAH66

DATE	START	STOP	HOURS	CPU/IO RATIO	AVG ACT SIZE(K)	USER MEM AVAILABLE	SYSTEM MEMORY	EXCESS MEMORY (+/-) CALC	PALC
811217	1001	1130	1.48	0.336	23.76	218	294	67	66

AVG # USER ACT WAITING MEM	AVG # SYSTEM ACT WAITING MEM	AVG # USER ACT IN MEM	AVG # SYSTEM ACT IN MEM	RATIO OF DURATION VS MEMORY TIME	% SLAVE MEM USED	TIME USER ACT SWAPPED
1.000	0.-	3.765	8.771	1.150	75.757	0.010 SEC

WAIT TIME FOR ORIGINAL ALLOCATION	DURATION OF USER ACTIVITY	# USER SWAPS	ACT/HOUR (THROUGHPUT)	USER ACT/HOUR (THROUGHPUT)	SWAPS PER HOUR
25.500	70.050 SEC	125	177.920	121.770	185.361

Figure 6-24. Memory Statistics Report

SPECIAL JOB MEMORY DEMAND REPORT ON SYSTEM NMCC ON 82-06-18

TIME	DEMAND TYPE	TIME TO SATISFY IN .1 SEC	SNUMB	SIZE OF DEMAND IN K	CURRENT SIZE IN K	CALL
11.78394(114703)	GEMORE	-99999	FTS	1	35	82
11.78417(114703)	MET	0	FTS	1	36	83
11.78578(114709)	GEMORE	-99999	FTS	4	36	86
11.78628(114710)	DENIED	10	FTS	4	36	88
11.78633(114710)	SWAP	2	FTS	40	40	91
11.79422(114739)	GEMREL	-99999	FTS	-1	39	93

**** SINCE LAST PRINT OUT FTS HAS ACCUMULATED 205 .1 SEC WAIT TIME, CURRENT TIME IS 1148

Figure 6-25. Special Job Memory Demand Report

```
                    DISTRIBUTION COLLECTED ON SYSTEM NMCC2 AT 11:54:15 ON 81-12-21

                              SESSION LENGTHS FOR SUBSYSTEM      TSS

INDIV.   CUMUL.   CUMUL.   INDIV.                     PERCENT OF OCCURRENCE                   REPORT
NUMBER   NUMBER    PRC      PRC    MINUTE   00   05   10   15   20   25   30   35   40   45   50   3
                                            I....I....I....I....I....I....I....I....I....I....I
  15       15     10.60    10.60    0-   0  Ixxxxxxxxxxx
  43       58     40.90    30.30    0-   5  Ixxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
  14       72     50.80     9.90    6-  10  Ixxxxxxxxxx
  16       88     62.10    11.30   11-  15  Ixxxxxxxxxxx
   8       96     67.70     5.60   16-  20  Ixxxxxx
  14      110     77.60     9.90   21-  25  Ixxxxxxxxxx
   .        .       .        .      .    .  .
   .        .       .        .      .    .  .
   .        .       .        .      .    .  .

142 ENTRIES TOTAL   AVERAGE =   17.33099   VARIANCE =   433.799   STANDARD DEVIATION =   20.828
```

Figure 9-11. Session Length Report

experiences a response time greater than or equal to the requested limit. The information printed includes Terminal ID, subsystem name, response time in seconds, and time of day. Refer to figure 9-12.

9.5.7 User Think Time Limit Report. This report is produced only if the user requests it with the THINK input option (subsection 9.6.7). This report will print out a line of information every time a terminal experiences a response time greater than or equal to the requested limit. The information printed includes Terminal ID, subsystem name, think time in seconds, and time of day. Refer to figure 9-12.

9.5.8 Terminal Session and High Terminal Usage Reports. The Terminal Session Report (figure 9-13) is produced whenever the Statistical Summary Reports are requested. The report gives an account of every session that occurs during the monitoring session. Every time a user logs off or is logged off due to a DN355 abort, TCALL, or monitor termination, an entry into this report is produced. The report gives the Log On Time, Log Off Time, Terminal ID, USERID, Subsystem, Subsystem Size (MIN MAX), Session Length, Response Time, # Inputs, # Outputs. If a terminal was logged onto a subsystem when CAM started, then there is no immediate way for CAM to determine the subsystem being used by the terminal. In this case, the CAM data record will be checked to see if a USERID exists for the terminal. If one does exist, it means the terminal is logged on to TSS and the log on name is changed from UNKNWN to TSS. If there is no USERID for this terminal in the record, the subsystem name is set to UNKNWN. This occurs for the WIN lines and any user logged on to VIDEO when the monitor is started. If a user JDACS to a new subsystem, CAMDRP will disconnect the current line, calculate all statistics and reconnect the line to the new subsystem. Both the USERID and Subsystem Sizes are given only for TSS users. It has been noticed that some WIN pseudo terminals appear logged onto TSS, but have no USERID and no input/outputs. The cause for this discrepancy is under investigation. The Session Length is given in seconds. The Response Time is given in seconds and is the average response time over the session. The # Inputs is the number of input requests sent by the user. The # Outputs is the number of output response groups sent to the user. This report can help pinpoint excessive response times. It can also be used to determine if a terminal is logged onto the system and is not being used (low inputs, high or low outputs, long session length).

The High Terminal Usage Report is included as part of the Terminal Session Report and provides a list of terminals that have been logged on for a specified percent (default 75%) of the session. This will list terminals by ID and type, give the percent of time the terminal was logged on, the number of sessions during this time, the number of inputs and the number of outputs from the terminal. (See figure 9-14.)

9.5.9 Opcode Count Report. This report (figure 9-15) is produced whenever the System Summary Reports are produced. This report gives a listing of all the opcodes that were transmitted between the H6000 and the DN355, and a count of how many of each opcode there were. This report is of interest mainly when the following opcodes appear:

```
EXCESS THINK/RESPONSE TIME REPORT FOR NMCC2 ON 122181

TERMINAL  C6  ON  SUBSYSTEM  TSS    HAD A THINK TIME OF  208 SECS AT 16:35:55
TERMINAL  CI ON   SUBSYSTEM  TSS    HAD A THINK TIME OF  120 SECS AT 16:48:21
TERMINAL  BT ON   SUBSYSTEM  TSS    HAD A THINK TIME OF  223 SECS AT 16:48:57
TERMINAL  BD ON   SUBSYSTEM  TSS    HAD A THINK TIME OF  197 SECS AT 16:49:11
TERMINAL  BT ON   SUBSYSTEM  TSS    HAD A RESPONSE TIME OF  50 SECS AT 16:43:54
```

Figure 9-12. Response Time/User Think Time Limit Report

TERMINAL SESSION REPORT FOR NMCC2 ON 102182 AT 14:18: 0.000

LOG ON TIME	LOG OFF TIME	TERMINAL ID	USERID	SUBSYSTEM	SUBSYSTEM SIZE MIN	SUBSYSTEM SIZE MAX	SESSION LENGTH	RESPONSE TIME	NUMBER INPUTS	NUMBER OUTPUTS
18:53:17	18:54:37	CN	DJ3JI32411	TS1	1K	3K	80 SEC	4.500 SEC	4	8
15:01:25	18:54:37	4C		SENDC			13993 SEC	0. SEC	0	0
18:48:31	18:54:37	AA	DJ8XC344JG	TS1	1K	26K	367 SEC	3.324 SEC	39	125
18:03:07	18:54:37	CV	DJ3NI33203	TSS	OK	29K	3090 SEC	10.120 SEC	103	499
14:18:58	18:54:37	A8		UNKNWN			16539 SEC	0. SEC	0	4618
18:42:07	18:54:37	AP	DJ3JI32401	TELNET			751 SEC	8.844 SEC	32	69

Figure 9-13. Term l Session Report

second, or 1.76 seconds. The shape of the distribution is symmetric -- about the same number of activities had values over 1.76 seconds as under 1.76 seconds, and the standard deviation is small when compared to the average. The absence of a second line under the "Entries Total" line indicates that no activities stayed in memory longer than 2.4 seconds. When a distribution resembles this example, use the "Average" printed at the bottom as the Representative Value.

14.6.2.2 Skewed Distribution. Figure 14-3 shows another distribution. This distribution is "skewed" (i.e., not symmetric), because most of the activities spent around 0.1 to 0.7 seconds in memory, while some spent as much as four or five seconds. Care should be taken when selecting a "Representative Value" from this distribution. If the analyst wants to emphasize the "typical" activity, which stayed in memory 0.3 seconds or less, he could select the "median" (the value which evenly divides the activities in the distribution -- half spent less time in memory, and half spent greater time in memory). In figure 14-3, the median is about 0.29 seconds. The median can be estimated from these reports by descending down the "Cumulative" column (not displayed in the figure) until the value first exceeds 50. The median falls within the time range of this row.

14.6.2.3 Distribution With Outliers. There are some instances when the distribution will also have some values that were too big to fit in the histogram. This condition will be indicated by an additional output line at the bottom of the report. This line will indicate the number of occurrences that were outliers, the average for just the outliers, and the average for the values that fit into the report, minus the outliers. The three important factors about these types of distributions are: (1) the amount of times they occur; (2) the percent of the total values that are outliers; (3) the "in-range average."

If the percent of outliers is greater than 10%, the analyst should use the overall average, given in the first line of the report, for any comparisons. If the percentage of out-of-range values is less than 10%, the analyst can use the "in-range average" value for his comparisons since the effect of the outliers will most likely be minimal on the total system performance.

14.6.3 Memory Evaluation. The first step in a memory evaluation is to summarize all the pertinent information. The easiest way to do this is for the user to create a table similar to figure 14-4. The information for each column is collected from various MUM reports. Once the chart is filled out, the analyst can then ascertain a reasonable idea of the overall memory status of the system. The reports required to collect the statistics will be discussed, as well as an analysis procedure. The current version of the MUM will automatically produce this table (see subsection 6.3.13 - Memory Statistics Report).

```
DISTRIBUTION COLLECTED ON SYSTEM NMCC AT 14:14:24 ON 81-05-15

      The Total Elapsed Time An Activity Was In Memory

                    Percent of Occurence

    Tenth    00   05   10   15   20   25   30   35   40   45   50
    Second    /    /    /    /    /    /    /    /    /    /    /

      0-1     Ixxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
      2-3     Ixxxxxxxxxxxxxxxxxxxxxxxxxxx
      4-5     Ixxxxxxxxxxxxxxxx
      6-7     Ixxxxxxxxxxx
      8-9     Ixxxxxx
     10-11    Ixxxx
     12-13    Ixxx
     14-15    Ixx
     16-17    Ix
     18-19    Ix
     20-21    I
       .
       .
       .
     56-57    I

     118669 Entries Total  Average 4.247  Variance 18.52  Standard Deviation 4.3
```

Figure 14-3. Sample Skewed Distribution

DISTRIBUTION COLLECTED ON SYSTEM NMCC AT 14:14:24 ON 81-05-15

<u>The Total Elapsed Time An Activity Was In Memory</u>

```
                    Percent of Occurence

Tenth     00   05   10   15   20   25   30   35   40   45   50
Second     /    /    /    /    /    /    /    /    /    /    /

  0-1     Ixxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
  2-3     Ixxxxxxxxxxxxxxxxxxxxxxxxxxx
  4-5     Ixxxxxxxxxxxxxxxx
  6-7     Ixxxxxxxxxxx
  8-9     Ixxxxxx
 10-11    Ixxxx
 12-13    Ixxx
 14-15    Ixx
 16-17    Ix
 18-19    Ix
 20-21    I
   .
   .
   .
 56-57    I
```

118669 Entries Total   Average 4.247   Variance 18.52   Standard Deviation 4.3

Figure 14-3. Sample Skewed Distribution

If Column 7 shows a surplus of memory, but does not exceed the aforementioned limits, the implication is that the current system has sufficient memory, but that the system is approaching memory saturation. If Colulmn 7 shows a shortfall of memory, and the value is greater than 15% of the total available memory or greater than two times the value reported in column 4, then the implication is that memory is a constraint on this system. Finally, if Column 7 shows a shortfall of memory, but does not exceed the aforementioned limits, the implication is that the system has reached memory saturation, but is still able to process the current workload.

Step 2 - It should be stressed that the value reported in column 7 is calculated over the entire measurement period and therefore could be biased by periods of heavy or light activity. It is for this reason that the user is urged to run the monitor during those periods of time where the workload is considered to be heavy and constant. In order to determine if the above type of biasing is occurring, the user may want to check Plots 1-3. If it appears that there is a mixing of light processing and heavy processing the user may want to re-run the data reduction program, using the time-frame option, to separate the heavy processing time.

Step 3 - Calculate the ratio of column 5 divided by column 4. This is an indication of the maximum number of user jobs that your system can support at any one time, without the occurrence of significant swapping. If the value in column 10 is equal to or exceeds this ratio, then the implication is that the system has reached memory saturation. If the value in Column 10 is within 2 units of the ratio, then the system probably has sufficient memory but is approaching saturation. Finally, if the value in column 10 is less than the ratio by more than 2 units, the current system has sufficient memory.

This step can be further verified by checking columns 14, 16 and 18 for indication of significant swapping.

Step 4 - If column 13 is less than 85, the current system should have sufficient memory and the other steps should not be showing indications of memory problems. If column 13 is between 85 and 95 then the current system is approaching saturation and at times may be showing some indications of a backlog. If the figure exceeds 95, then other steps should be indicating signs of moderate to severe memory problems.

Step 5 - If column 8 is greater than or equal to 3, the indication is that memory has become a constraining factor.

Step 6 - If Column 12 is greater than 2, the indication is that memory wait time is high and that memory is probably a constraining factor.

At this point, the user should have a fairly good indication as to whether or not memory is a constraining factor. The following steps will indicate some additional reports that the user should reference to determine those jobs that might be causing the memory problem.

Step 7 - One of the largest users of resources are jobs that abort and then must be rerun. Aborts usually occur due to user errors, but hardware aborts are not uncommon. If management is aware of aborting jobs and the reasons for them, they can possibly save substantial system resources. The Abort Report is described in subsection 6.3.8 and gives an indication of the system resources being wasted by aborting jobs.

Step 8 - It is important for management to be aware of jobs that are either misusing system resources or are requesting large amounts of system resources. Upon identifying such jobs, these jobs could be redesigned, scheduled for non-peak processing, or, in the case of wasted resources, the waste could be eliminated. The Excessive Resource Report allows the user to uncover jobs of this type and is described in subsection 6.3.10. When using this report, the following are suggested parameter values:

wasted core - 5K
memory - either 35K (WWMCCS standard) or 2 times the value in column 4
CPU time - 15 minutes
IO time - 30 minutes
URG - 40
RATIO - 2

Step 9 - By examining the System Program Usage of Memory Report, the user can determine those system type jobs that are requiring memory. It is possible that some of the system jobs can be eliminated or at least reduced in size. This is especially true for the TSS. However, it must be realized that a limitation on Time Sharing size may adversely effect TSS response. In many cases, if large file transfers are being processed during prime time, the size of the FTS WIN subsystem can rise to 70 or 80K. By not allowing WIN file transfers to run during prime time, significant memory savings can result.

Step 10 - As is explained in great detail in subsection 6.3.15, it is vitally important that the overall urgency level of jobs being processed remain low. The Distribution of Urgency Report can be used to determine the overall urgency level of jobs being processed. This report should show that 60 percent of the jobs being processed at any one time have an urgency level below 40 and that a substantial proportion of these should have an urgency level between 5-10. The summary at the bottom should indicate that 75-80 percent of all activities processed had an urgency level below 20.

If this report indicates a large percentage of high-urgency jobs, then the SNUMB/IDENT report, or the Excessive Resource Report, can be used to identify those particular activities processing with a high urgency.

Step 11 - If the analyst wants to track the memory performance of a given set of jobs, the use of the SPECL input option and the generation of the Special Job Memory Reports will prove sufficient for detailed memory tracking. This procedure is especially useful in analyzing the memory requirements of TS1, FTS and the special JDA-developed software (JDSIP, JDSUP). Refer to subsections 6.1.24 and 6.3.14 for complete discriptions of these Special Job Memory Reports.

Step 12 - Another indication of poor system performance possibly caused by memory shortfall, tape drive shortfall, poor operator performance or a poor system scheduler design is the long delay of jobs as they pass through the various allocation phases prior to core allocation. The Allocation Status Report, the System Scheduler Delay Time Histogram and the Delay Time Until Core Allocation Histogram can all be used to determine which jobs, and how many jobs, are being significantly delayed during the various allocation phases. These reports are all fully discussed in section 6.

Step 13 - Memory problems may also be occurring as a result of jobs being delayed due to CPU constraints or I/O constraints. In these cases, jobs tend to sit in memory due to a lack of other system resources. Because these jobs are being delayed, other jobs cannot enter memory, and memory demands begin to backlog. Therefore, if memory is a constraint, the user should consider conducting a CPU analysis as well as an I/O analysis.

14.6.4 CPU Evaluation. The CPU evaluation will determine the general utilization level of the processor and then determine if the CPU is dominated by GCOS or user program execution. A CPU data reduction is required for this evaluation. It is also beneficial to have an associated MUM data reduction available for the same time period. Figures 14-5 and 14-6 are sample table formats that may be used to display the gathered data.

14.6.4.1 Data Recording. For Figure 14-5, data for columns 1 and 14 can be obtained from the heading page. Data for columns 2-8 can be obtained from the last section of the CPU Time Report. This report is produced every 10 minutes of elapsed time and the data of interest should be found in the last 10-minute report. Columns 9-13 are filled from Histogram Reports 1, 2, 5, 6, 9 respectively. For figure 14-6, the data may be obtained directly from the last line of the CPU Plot.

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#1	#2	#3	#4
Date-Time	% Less Than 25	% Between 25-50	% Greater Than 50

Figure 14-6. CPU Processor Availability

Step 7 - The CPU Time Report and WIN Report can be used to determine those periods of time when TSS and/or WIN programs are using excessive amounts of processor time or, on the other hand, do not appear to be requesting sufficient CPU service.

14.6.5 I/O Evaluation. The I/O evaluation will determine whether the mass storage subsystem, or tape channel subsystem is the cause of system degradation. This evaluation requires the user to have processed the Mass Storage Monitor and Channel Monitor data reduction programs.

14.6.5.1 Data Recording. All output from the Mass Store Monitor and Channel Monitor are required. No individual work tables are required, but the user may generate some if he feels that it will help in his analysis.

14.6.5.2 Evaluating the Data. Chapters 7 and 8 provide a fairly detailed description of the procedure to be followed in analyzing the associated reports. In this section, reference will be made to those chapters indicating actual data values that should be used as a reference for comparison.

Step 1 - Read subsection 7.3 and subsections 8.2 and 8.3.

Step 2 - Check the crossbar configuration using the procedure described in subsection 8.2.

Step 3 - Examine the Proportionate Device Utilization Report produced by either the MSM or CM. Check for devices which have significantly higher utilization than other devices in the system. These devices are potential bottlenecks and should be more closely analyzed. It is desirable, even though perhaps not possible, to have equal utilization across all disk packs. Read subsections 7.5.18 and 7.5.20 for further details on this step. Once a pack(s) is identified, further analysis should be performed to determine the actual files being referenced on the pack (see subsection 7.6.1).

Step 4 - The histogram displaying Data Transfer Sizes for TSS Swap Files can give a strong indication of the sizes of TSS subsystems being used. TSS subsystems of over 25K can cause significant increase in overall TSS response, especially if several of these subsystems are being executed simultaneously. If more than 20 percent of the entries in this report fall in the bucket ranges above 25000, this is a strong indication that TSS response might be a problem. This problem can be further confirmed with the CAM.

Step 5 - Seek Elongation - Subsectons 7.5.6 and 7.5.7 describe in detail the reports used to investigate seek elongation problems. An average seek of over 50 cylinders for DSS191s and 100 cylinders for DSU450's should be considered significant.

Step 6 - Analyze the Channel Monitor Idle Report. This report can be generated only if the Idle Monitor was run in conjunction with the Channel Monitor. If the "% of Idle Time During Which I/O Was Active" value exceeds 25%, then substantial benefit may be obtained by eliminating I/O contention. The above value is an indication that even though the CPU is going idle (i.e., has no useful work to perform) there really is potential CPU work available. However, under current conditions, this potential CPU work is being delayed because of I/O contention.

Even though the above figure exceeds 25%, the system may not have sufficient CPU power available to handle the increased work generated by removing the I/O contention. Therefore, the analyst should also check that the "Average System % Idle" figure exceeds 15%. If this proves to be the case, then removal of any I/O contention should prove beneficial. On the other hand, if the figure is lower than 15%, then removal of any I/O contention will probably result in additional CPU contention. The Idle Report will also indicate those devices causing most of the contention. Make a record of the device numbers.

Step 7 - Examine I/O queue length and I/O queue time histograms for individual devices and channels. Queues greater than one and queue times greater than 15 MS should be considered significant. Record those devices with high contention.

Step 8 - If certain devices have been determined as bottlenecks under the procedures described in Steps 1 and 2, the Job Conflict Report should be obtained for those devices following the procedures described in Chapter 8.

Step 9 - Execute the Mass Store Monitor Data Reduction Program. Following the procedure described in subsection 7.6.1 for monitoring a specific device, the analyst should be able to determine the exact files that are causing the contention found under the earlier steps.

Step 10 - Using the CM, it is possible to perform a detailed analysis on channel queuing for a particular job. Details for this procedure can be found in subsections 8.5.13, 8.5.14 and 8.6.10.

Step 11 - This step outlines procedures for relocating files identified as candidates for file relocation. Because of automatic load-leveling activity by the GCOS operating system, an analyst has only limited flexibility for the placement of system, permanent, and temporary files:

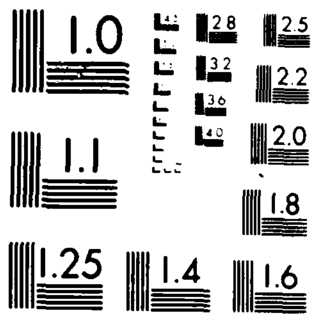
a. <u>System Files</u>. The device name on which a system file is to be placed can be specified at system startup. Care should be taken to insure that multiple high-used system files are not placed on the same disk device. If possible, separate high-use system files across disk subsystems. In addition, ensure that SSA Cache memory and FMS cache are enabled to reduce disk I/O activity to certain system files. Details for this analysis can be found in subsections 7.5.9, 7.5.10 and 7.5.19.

AD-A124 071 GENERALIZED MONITORING FACILITY USERS MANUAL(U) COMMAND AND CONTROL TECHNICAL CENTER WASHINGTON DC B WALLACK ET AL. 01 DEC 82 CCTC-CSM-UM-246-82-CHG-3

2/2

UNCLASSIFIED F/G 9/2 NL

END
DATE
FILMED
2-83
DTIC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0

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b. Permanent Files. The device name for a permanent file can be specified at creation, whether through FMS or the ACCESS subsystem of Time Sharing. Files can be moved by changing their names, creating a new file with the old name, and moving the data. The new file can be created with a DEVICE specification.

c. Temporary Files. The device name for a temporary file can be specified in the second field of the $FILE card in the job control deck. Jobs which run frequently can have their $FILE cards changed. Other jobs can be controlled by policies governing the use of $FILE cards.

Additionally, sites that have different device types may specify preferred device types to be used for temporary files. This procedure will allow activities requiring disk storage to take advantage of higher speed devices.

Step 12 - This step identifies possible seek contention problems attributable to inadequate temporary file space. This procedure uses the SPUTIL feature of the GCOS FMS facility and the Disk Fragmentation Report available at most sites. If such a report is not available, contact CCTC/C751. It is necessary to analyze temporary disk capacity on all disk units rather than just the units identified in previous tuning steps. This analysis is necessary because the disk units exhibiting high activity due to temporary file use often have more available temporary space. The increased utilization of these disk units may be caused by inadequate temporary storage on other disk devices. For this analysis a form as shown in figure 14-7 may prove useful.

a. Report Values. The SPUTIL Report contains the following information on each disk device: (1) device identification, (2) overall capacity, (3) available disk space, (4) disk space dedicated to permanent storage. The Disk Fragmentation Report contains additional information on each disk device: (1) number of disk fragments, (2) average fragment size, (3) maximum fragment size, (4) percentage distribution of fragments by size, and (5) total fragmented space.

b. Form Entry. Enter the device identification for each disk device on the Temporary Storage Test Form. For each disk device enter: (1) the LLINK capacity as indicated by the SPUTIL Report in the Total Capacity column; (2) the temporary capacity from the SPUTIL Report in the Temp Capacity column; (3) the number of fragments from the Disk Fragmentation

DEVICE	TOTAL CAPACITY	TEMP CAPACITY	RATIO1	RATIO 2	NUMBER OF FRAGMENTS	MAX SIZE	PERCENT FRAGMENTS		TOTAL PERCENT	FRAGMENT
							1-12	13-121		

Figure 14-7. Temporary Storage Test Form

SECTION 15. TIMESHARING EMULATION AND RESPONSE TIME SYSTEM (TEARS)

15.1 Introduction

The Timesharing (TSS) Emulation and Response Time System (TEARS) is a collection of FORTRAN programs which sequentially processes data the Timesharing Subsystem Monitor (TSSM) collected and written to tape. There are three separate and independent phases of reduction: response time analysis, TSS emulation, and optionally, a formatted dump. TEARS produces a number of reports showing the user load supported by TSS, computer resources expended, user response times, and service interruptions. A list of reports and report descriptions is presented in subsection 15.5.

The TSS Monitor and its companion data reduction package, TEARS, provide information to:

- o Identify those time periods in which TSS response to the user was abnormally poor.
- o Identify which resources -- CPU, I/O, memory, or non-TSS competition -- contributed to the poor response.
- o Localize the agent of poor response down to the users command, user or subsystem.

TEARS uses two inputs. The first is the data tape produced by the TSSM in the General Monitor Collector (GMC). The second input is a set of report option control cards used to alter the reports in a way other than the standard default. The various options and their formats are described in subsection 15.6.

Caveat: Section 15 is a general description of TEARS, its reports, and run-time options. It is not intended as a users manual for analysis. Little is provided here as "rules-of-thumb" toward identifying a TSS session showing abnormal behavior or as guides to interpreting the reports. An extension to section 15, in preparation but not currently available, will explain how to interpret the reports and perform an analysis.

15.2 Data Collection Methodology

The TSSM in the GMC uses trace type 74 to collect data about the TSS in execution. TSS transactions are trapped at 104 points within TSS and at one point external to the TSS; each trap produces a trace 74. Section 5 provides a description of the trace mechanism and of the 105 trace subtypes. With the information thus collected, TEARS maintains a list of active users and correlates TSS transactions with a particular user. The interaction between a user terminal and TSS is traced as is the interaction between GCOS and TSS. Processor allocation, memory allocation and user disk I/O are also sources of data.

15.3 Analytical Methodology

TEARS is a multipass program that requires analysis after each pass. The first pass displays user response time (technically, duration of line idle -- from the H6000 side of the DATANET). That display is a collection of charts, each of which shows a demand or response characteristic from minute to minute over the duration of the run. Using the charts* an analyst can determine selected timeframes of poor response for a second pass analysis of the data tape.

The second pass analysis mimics or emulates the TSS process in a limited fashion -- it remembers, dynamically, what each TSS user was doing or attempting to do, how long the attempt was ongoing, the obstacles encountered in the attempt, and some of the computer resources and TSS executive services used in the attempt. Additionally, the second pass identifies events that were of severe import or were catastrophic to the user. Several charts, histograms, and tabular reports provide both summary and snapshot of the mimic phase. Sufficient data is presented for a manual or deductive completion of the analysis.

TEARS will generate additional reports if the CPU Monitor was active.

While the response time and emulation phases are independent, the reports produced are complimentary -- there are several auxiliary reports generated by the response time phase useful for determining the distribution of CPU resources across the entire system and also within TSS.

An optional third pass is an investigative and debug tool for the more technical user. It provides a formatted dump for examining TSS transaction content, sequencing and anomaly.

TEARS produces tabular reports, histograms, and logarithmic bar charts as tools for analysis. Of the three types, the logarithmic bar chart is new to GMF reduction programs - it is a variation of the standard plot seen in other sections of this manual. Most of the bar charts described in following subsections represent, in two ways, the duration of some frequently occurring process. The chart is ordered by clock time and is arranged vertically on the page. The time interval between print lines is under user control with a granularity of one second. For each print line, the left half of the chart is a histogram (or interval-o-gram) showing how many such processes were observed in each of several duration lengths (buckets) during the observation interval. If the process is attributable to a TSS user, the user with the longest duration is identified under the column heading "LINE". The right half of the chart prints the minimum,

---

* Independently, the CAM Monitor and associated data reduction package can identify periods of poor response.

the average, and the maximum duration as horizontal bars on a logarithmic scale. The usual way of printing a multivariable bar chart is to lay the bars side by side:

```
        minimum     mmm
  time  average     aaaaaa
        maximmum    MMMMMMMMM
```

To make the charts compact, we have overlaid the average bar with the minimum bar and then that composite bar overlays the maximum bar:

```
  time              mmmaaaMMM
```

If 2 or more bars are of equal length, a digit "2" or "3" is printed in lieu of the characteristic bar symbol. (A "2" is used if 2 bars are of equal length; "3", if all 3 bars are of equal length.) If one or more bars fails to cross the left margin (axis), the axis symbol, "I", is replaced with an asterisk. If one or more bars would break the right margin, an asterisk is printed in lieu of the bar symbol.

For each observation interval (print interval), a process is counted if (1) it terminates during the observation interval, or (2) it is ongoing at the end of the interval. In either case, the duration is measured from the beginning of the process, not from the beginning of the observation interval. Therefore, a process which spans two or more observation intervals will be counted once in each observation interval, and its reported duration may exceed the observation period.

These bar charts are intended as visual displays. It is patterns and trends and order-of-magnitude changes that are important, not the ability to convert a bar length to a numeric with accuracy (the line printing mechanism forbids accuracy anyway). The default method of displaying the y-axis shows numeric values at each order-of-magnitude only:

```
1.0E01                                          1.0E02
Y-----------------------------------------------Y
```

By user option (option (logscale)), intermediate values can be displayed:

```
1.0E01                                          1.0E02
Y--------------2--------3-----4----5---6--7-8-9-Y
```

15.4 Data Reduction Methodology

TEARS is configured to correlate up to 50 concurrent TSS users (real and deferred) with user-generated traces. If the GMC data tape shows a TSS user load greater than 50, TEARS will terminate the reduction pass and print all accumulated reports to that point. To increase (or decrease) the 50-user limit, edit, then recompile the source file B29IDPXO/SOURCE/TEARS as follows:

```
CASE
B RVS:/USTSUP = 50/;*:/USTSUP = NN/
```

where NN is the new concurrency limit. It is fruitless to set NN beyond 100, because the TSS Monitor will generate no traces with a TSS user load that large.

TEARS, like most other GMF packages, uses the system controller clock to measure the passage of time. Precision of the clock is 1 microsecond, and its capacity is 35 bits. Unlike the other GMF packages, no provision exists in TEARS to account for clock overflow. TEARS is thereby limited to reducing GMC sessions shorter than approximately 9.5 hours. On reaching the time limit, TEARS will terminate the reduction pass gracefully.

15.4.1 <u>Response Pass Reduction Methodology</u>. This pass performs an overview of TSS response during the data collection period. The reports generated give an indication of the periods of time when response, as observed by the user, was poor.

To accomplish this, the response pass keeps track of the following information:

Start and stop of all terminal I/Os
Start and stop of all user subdispatches
Start and stop of all disk I/Os
Requests for core by subsystems
Changes of each user's program stack
Special situations (JDAC, CONN, etc.).

To produce the response time logplots, the program measures the amount of time from the completion of a terminal I/O until the initiation of a subsequent output transmission. This value, the line-idle period, is used as a datum for the "Response Time For All Users" logplot, provided none of the following situations have occurred:

> If the user's subsystem executes a DRL WAKE, it is assumed that the user knows that the line idle is being extended (e.g. DJST). If the user performed a line-switch to another program, the line will be idle as far as TSS is concerned, but not used in the logplots. If the user performed a non-graceful logoff (e.g. $*$D, or CTRL-C), the UST which was set for reconnect will not contribute to the logplot.

Additionally, each datum used in the All-User logplot will be used in one of the other two response time logplots. The distribution of data between the two logplots is based on the presence of a request-for-core trace (TSS subtypes 77-78) during the line-idle period. This produces a segregation of responses for users in build mode or with program-in-core versus users requiring a program call or normal swap in. Comparison of these reports will indicate when poor response may be due to core contention (provided sufficient users are logged on to produce enough plotting data). This problem would be indicated by a degradation on the "Response Time For Users With Core Request During Line Idle" logplot without a corresponding one on the "Response Time For Users Not Requesting More Core" logplot.

These logplots can be distorted by a user who performs an extensive amount of disk I/O or CPU work without doing any terminal I/O. The effect would show up as a long period of line idle because the reduction program could not invalidate that time datum. As a run-time option, the amount of time spent doing disk I/O and the amount of processor time can be subtracted from each datum, thus reducing, but not eliminating, the erroneous effect.

To produce the subdispatch logplots, the program measures the amount of time from the point where a user is inserted into the subdispatch queue, to the point where the user is processed as a fault entry after receiving a subdispatch. The logplot "Total Time In Subdispatch Queue" reflects this time value. The logplot "Time in Subdispatch Queue Waiting Service" is the total time value minus the actual processor time used by the subsystem. The latter value has been separated out to produce the logplot "Processor Time in Subdispatch."

15.4.2 Emulation Reduction Methodology. This, the second phase of TEARS, simulates the TSS process in a limited fashion. Each user is placed in one of several defined states (table 15-1) corresponding to the manner in which TSS processes a user. For each user, TEARS maintains a state-stack; pushing, popping, or clearing of the state-stack is driven by a complex algorithm. The nature of the current trace for the user, the user's Time Type (a TSS classification), and his current and previous states interact in deciding which state-stack operation will be performed. Several states are considered vulnerable for a user -- if he remains in one of these states too long, a service for him is being delayed or denied. In a similar fashion, the TSS Executive may be denied CPU access thus delaying all users. These separate events, user delays in vulnerable states, and TSS Executive delays, are examined and reported on together so that the effect of one on the other may be seen.

As each user transits from state to state, several statistics are updated. They indicate possible bottlenecks in CPU processing, I/O, or memory allocation from minute to minute. The statistics are taken across all users and provide a functional representation of TSS bottlenecks. (The CPU reports are created in the Response phase described in section 15.5.1.4, but find application in the Emulation phase).

Concurrently with the simulation, each trace is examined as an indication of TSS trouble. Just by their occurrence, several traces indicate TSS or GCOS trouble. Over 40 conditions, many concerned with derail errors, are taken as exceptions and are items for reporting.

Table 15-1. Emulation Phase User States

#	Mnemonic	Description	Vulnerable?
1	GWAKE	In Gewake	
2	LIDLE	Line is idle	
3	WTSUB	Eligible for subdispatch	
4	RECON	In reconnect mode	
5	SWPOU	Swapping out	Yes
6	SWPIN	Swapping in	Yes
7	DSKIO	Doing disk I/O	Yes
8	SUBDS	In subdispatch queue	Yes
9	WTMEM	Waiting for memory	Yes
10	DRLSR	Waiting for derail service	Yes
11	NOTSS	Non-TSS process	
12	FMSER	Waiting FMS service	Yes
13	WTSMC	Waiting SMC service	Yes
14	LBUSY	Line is busy	
15	IDLME	Idle in memory	
16	UNKWN	Unknown (initial state)	
17	LOGOF	Logged off (final state)	

15.5 Output

Each of the three reduction phases (passes) provides independent but complementary reports. Each report begins with a banner line identifying the TEARS program, the version, and the version date. The banner is usually followed by a line identifying the data source -- this includes system identification, time of day, day of week, date (year-month-day) and reel number of the lead-off GMC data tape. The day of the week and date are continually updated and reflect the correct GMC start time or, when user selected, the time datum of the first collectable trace within a timeframe. Following the data source line is the report title and report number.

The reports generated by the TEARS reduction passes fall into three categories: summary, interval driven, and event driven. Summary reports are generated at the end of a timeframe or at the end of the pass (e.g., Histograms). Interval driven reports are generated at the end of a short time period (defaulting to 60 or 20 seconds) repeatedly during a timeframe (e.g., Logplots). Event driven reports contain data generated when certain traces or conditions are encountered during the processing of the collection tape. The information is organized as a chronological listing.

One report, the Execution Summary (figure 15-1), is common to all three reduction phases; it shows what TEARS found on the data files. Included in this information is the following:

- A list of the monitors in execution during the GMC data collection.
- The time, date, tape number and system controller clock at the beginning of collection.
- An echo of the user input options, and the program's interpretation of them.
- If the timeframe option is used, a report of when the various timeframes were reached.
- If the collection period exceeded 9+ hours, an indication that a 35-bit internal clock overflowed (TEARS will then terminate the pass).
- The time, date, tape number and system controller clock at the end of data collection, but only if a termination trace is processed (not currently implemented).
- When the NEW option is user selected, the items above are repeated on a new page.

All remaining reports are generated by the individual reduction passes.

The reports that the Response pass produces are:

<u>Trace driven reports</u>:

- TSS Reduction Event Log (figure 15-2) (no ID #).

```
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

     ACTIVE MONITORS:  **** **** CPUM  **** **** **** **** **** **** **** TSS    ****

     DATA COLLECTION BEGAN WITH TAPE 1469   AT 0818:33.201 FRI 82-05-21,
     RSCRA/Q WERE  000000000031 460323216133

CARD INPUT IS INTERPRETED AS FOLLOWS:

 1:OPTION(-SUBDISPATCH) OPTION(-DISKIO)
     WILL DO -SUBDISPATCH
     WILL DO -DISKIO

 2:CPRINT(20)
     PERIODIC REPORT REPETITION PERIOD IS NOMINALLY 20        SECONDS.

 3:NEW(1469)
     TAPE 1469   WILL LEAD OFF A FOLLOWING REDUCTION.
      *-->  BREAKPOINT AT 0818:54.01


TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

     ACTIVE MONITORS:  **** **** CPUM  **** **** **** **** **** **** **** TSS    ****

     DATA COLLECTION BEGAN WITH TAPE 1469   AT 0818:33.201 FRI 82-05-21,
     RSCRA/Q WERE  000000000031 460323216133

CARD INPUT IS INTERPRETED AS FOLLOWS:

 1:ON(FORMATDUMP)
     FORMATTED DUMP TURNED ON .
```

Figure 15-1. Execution Summary Report

TIME SHARING REDUCTION EVENT LOG

```
0818:33.20 ***** MAIN INITIALIZED *****  20.00 SEC. PLOT INTERVAL *****
0818:43.51        0 *** TIMEFRAME ******** BEGIN *****
0818:54.01        1= 90=     =     = ***** TRACE ON *****
0818:54.01        5= 90=     =     = *****  4 USERS *****
0823:21.44     7149= 71=     =     = ** UST AREA INCREASE.     5 USERS.
0823:21.51     7184= 32=<TA>=NEW = LOGON    HIS8010
0824:06.74     8785= 32=<TK>=NEW = LOGON    C433
0826:44.40    16814= 32=<VV>=NEW = LOGON    C722
0826:45.04    17155= 71=     =     = ** UST AREA INCREASE.     7 USERS.
0828:44.92    21220= 32=<CG>=NEW = LOGON    WSSIB
0834:41.42    38142= 32=<TI>=NEW = LOGON    PRC118
0835:48.38    41838= 44=<DI>=JDAC= LINE SWITCH TO INQUIRY NAME VIDEO
0842:34.15    66305= 12=<TI>=TERM= LOGOFF   PRC118        ON AT  834.41
0843:09.43    67126= 32=<TX>=NEW = LOGON    SS1SM
0843:47.87    68557= 32=<T2>=NEW = LOGON    PRC101
0844:18.47    71175= 12=<T2>=TERM= LOGOFF   PRC101        ON AT  843.48
0844:45.77    72586= 98=     =     = ** UST AREA INCREASE.     9 USERS.
0844:47.35    72663= 32=<3X>=NEW = LOGON    IRCNTI
0845:15.51    74967= 32=<DN>=NEW = LOGON    HIS
0845:20.80    75598= 32=<T5>=NEW = LOGON    CSC
0845:21.20    75739= 71=     =     = ** UST AREA INCREASE.    13 USERS.
0845:21.31    75788= 32=<T2>=NEW = LOGON    PRC101
0847:19.78    96856= 22=<T2>=EDTX=   LINE SET FOR RECONNECT
0847:19.79    96863= 12=<DN>=TERM= LOGOFF   HIS           ON AT  845.15
0847:22.77    96886= 22=<TK>=CMDL=   LINE SET FOR RECONNECT
0847:22.78    96889= 22=<TN>=DJST=   LINE SET FOR RECONNECT
0848:38.66   100204= 32=<  >=NEW = LOGON    CSC
0848:59.64   104802= 12=<  >=TERM= LOGOFF   CSC           ON AT  848.35
0849:00.78   105160= 32=<T2>=NEW = LOGON    PRC101
0849:15.98   105889= 58=<T2>=CONN=   CONN COMMAND TO =T2=
0849:16.21   105968= 12=<T2>=TERM= LOGOFF   PRC101        ON AT  849.01
0849:54.15   107675= 32=<CH>=NEW = LOGON    ACMIS
0850:19.96   108868= 12=<TN>=TERM= LOGOFF   PRC104        ON AT  816.23
0850:20.14   108893= 12=<TK>=TERM= LOGOFF   C433          ON AT  824.07
0850:30.26   109360= 32=<TN>=NEW = LOGON    CSC7592
0851:44.14   113369= 12=<CG>=TERM= LOGOFF   WSSIB         ON AT  828.45
0852:21.28   114942= 12=<TA>=TERM= LOGOFF   HIS8010       ON AT  823.21
0852:53.32   116852= 32=<DJ>=NEW = LOGON    C432
0854:03.46   121808= 32=<TK>=NEW = LOGON    PRC118
0854:05.48   122391= 32=<TS>=NEW = LOGON    PRC105
0855:19.36   130701= 32=<TI>=NEW = LOGON    CSC8121
0856:50.36   143038= 22=<TX>=NONE=   LINE SET FOR RECONNECT
0859:48.10   179626= 12=<TX>=TERM= LOGOFF   SS1SM         ON AT  843.09
0859:59.61   180159= 32=<  >=NEW = LOGON    CSC
0900:14.27   184775= 12=<  >=TERM= LOGOFF   CSC           ON AT  859.58
0900:53.82   188034= 12=<DJ>=TERM= LOGOFF   C432          ON AT  852.53
0900:53.82   188035= 99=     =     = ** UST AREA DECREASE.    12 USERS.
0906:06.37   222036= 22=<DI>=JDAC=   LINE SET FOR RECONNECT
0906:06.52   222107= 71=     =     = ** UST AREA INCREASE.    13 USERS.
0906:10.12   222287= 32=<DI>=NEW = LOGON    MASB
0906:21.18   224085= 58=<DI>=CONN=   CONN COMMAND TO =DI=
0906:21.43   224170= 12=<DI>=TERM= LOGOFF   MASB          ON AT  906.06
0909:03.30   254008= 12=<TK>=TERM= LOGOFF   PRC118        ON AT  854.03
0912:43.40   272875= 12=<DI>=TERM= LOGOFF   MASB          ON AT  814.41
0913:35.14   277724= 32=<DJ>=NEW = LOGON    HIS
0914:45.30   289489= 12=<TN>=TERM= LOGOFF   CSC7592       ON AT  850.30
0921:31.55   319884= 12=<T2>=TERM= LOGOFF   PRC101        ON AT  845.21
0923:01.71   325371= 32=<TA>=NEW = LOGON    PRC101
0927:02.73   373064= 32=<TK>=NEW = LOGON    HIS
0928:41.54   393158= 12=<TK>=TERM= LOGOFF   HIS           ON AT  927.03
0929:30.73   409020= 32=<2X>=NEW = LOGON    IRCNTI
0929:41.40   412835= 22=<TC>=EDTX=   LINE SET FOR RECONNECT
```

Figure 15-2. Timesharing Reduction Event Log Report

Elapsed-time driven reports:

- o Response Time For All Users (figure 15-3) (ID #4)
- o CPU Times Allocated To TS1-EXEC and TS1-SUBDISPATCH (figure 15-4) (no ID #) (subordinate to the above report)
- o Response Time For Users Not Requesting More Core (figure 15-5) (ID #6)
- o Response Time For Users With Core Request During Line Idle (figure 15-6) (ID #5)
- o Total Time In Subdispatch Queue (figure 15-7) (ID #10)
- o Time In Subdispatch Queue Waiting Service (figure 15-8) (ID #11)
- o Processor Time In Subdispatch (figure 15-9) (ID #12).

Summary reports:

- o TSS Subtraces Encountered (figure 15-10 parts 1 and 2) (ID #1 & #2)
- o Derails Executed By Users (figure 15-11 parts 1 and 2) (ID #7 & #8).

The reports that the Emulation pass produces are:

Trace driven reports:

- o Exception Message Report (Tabular) (figure 15-12) (no ID #) and
- o Users Map (Tabular) (figure 15-13) (ID #3) (subordinate to above report)
- o TSS Delay & User Delay Report (Tabular) (figure 15-14) (no ID #) and
- o TSS Core Map (Tabular) (figure 15-15) (no ID #) (subordinate to above report)
- o Error Message Report (Tabular) (figure 15-16) (no ID #).

Elapsed-time driven reports:

- o Intertrace Gap - Duration (Tabular and Logplot) (figure 15-17) (ID #13)
- o Memory Activity (Tabular) (figure 15-18) (no ID #) (subordinate to above report)
- o Eligibles For Subdispatch - Duration (Tabular and Logplot) (figure 15-19) (ID #14)
- o In Subdispatch - Duration (Tabular and Logplot) (figure 15-20) (ID #15)
- o Eligible For & In Subdispatch - Duration (Tabular and Logplot) (figure 15-21) (ID #16)
- o User Swaps - Swap Rate (Logplot) (figure 15-22) (ID #17)
- o User Swaps - Swap Amount (Tabular and Logplot) (figure 15-23) (ID #18)
- o User Swaps - Duration (Tabular and Logplot) (figure 15-24) (ID #19)
- o User I/Os - Duration (Tabular and Logplot) (figure 15-25) (ID #20)
- o In System Master Catalog Wait - Duration (Tabular and Logplot) (figure 15-26) (ID #21).

Summary reports:

- o Intertrace Time (Adjusted for TSS GEWAKES) (Histogram) (figure 15-27) (ID #9).

.S REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

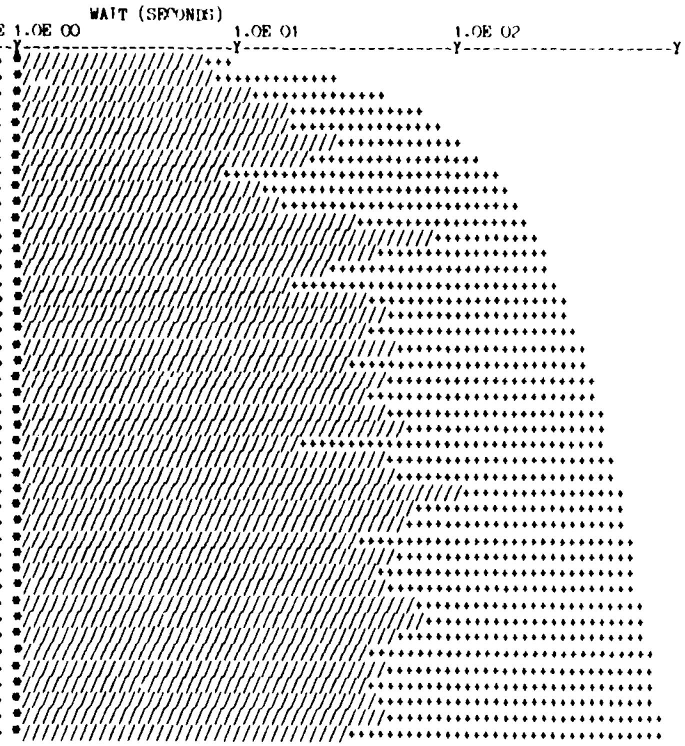
DISTRIBUTION COLLECTED ON SYSTEM DSCC1 AT 0818:43.515 FRI 82-05-21. INITIAL GMT TAPE #1469

RESPONSE TIME FOR ALL USERS

PLOT- 1

-= MIN /= AVG += MAX

USERS	TIME	<1	<2	<4	<8	<16	<30	>30	LINE
4	819:03.52	1	.	.	.	3			<DI>
4	819:23.52	6	.	.	.	.	2		<DI>
4	819:43.52	7	.	.	.	.	.	2	<DI>
4	820:03.52	6	.	.	.	.	.	2	<DI>
4	820:23.52	8	.	.	.	.	.	2	<DI>
4	820:43.52	6	.	.	.	.	.	2	<DI>
4	821:03.52	10	.	.	.	.	.	2	<DI>
4	821:23.52	16	.	.	.	.	.	1	<DI>
4	821:43.52	12	.	.	.	.	.	1	<DI>
4	822:03.52	10	1	.	.	.	.	1	<DI>
4	822:23.52	5	.	.	.	.	.	1	<DI>
4	822:43.52	2	.	.	.	.	.	1	<DI>
4	823:03.52	5	.	.	.	.	.	1	<DI>
5	823:23.52	8	1	.	.	.	.	1	<DI>
5	823:43.52	16	.	.	.	.	.	1	<DI>
5	824:03.52	7	.	.	.	.	.	1	<DI>
6	824:23.52	6	.	.	.	.	.	1	<DI>
6	824:43.52	7	1	.	.	.	.	1	<DI>
6	825:03.52	5	1	.	.	.	.	1	<DI>
6	825:23.52	11	.	.	.	.	.	1	<DI>
6	825:43.52	8	.	.	.	.	.	1	<DI>
6	826:03.52	9	1	.	.	.	.	1	<DI>
6	826:23.52	9	.	.	.	.	.	1	<DI>
6	826:43.52	7	.	.	.	.	.	1	<DI>
7	827:03.52	23	1	.	.	.	.	1	<DI>
7	827:23.52	10	.	.	.	.	.	1	<DI>
7	827:43.52	9	.	.	.	.	.	1	<DI>
7	828:03.52	4	.	.	.	.	.	1	<DI>
7	828:23.52	8	.	.	.	.	.	1	<DI>
7	828:43.52	9	.	.	.	.	.	1	<DI>
8	829:03.52	16	.	.	.	.	.	1	<DI>
8	829:23.52	11	.	.	.	.	.	1	<DI>
8	829:43.52	14	1	.	.	.	.	1	<DI>
8	830:03.52	13	.	.	.	.	.	1	<DI>
8	830:23.52	10	.	.	.	.	.	1	<DI>
8	830:43.52	8	1	.	.	.	.	1	<DI>
8	831:03.52	13	.	.	.	.	.	1	<DI>
8	831:23.52	18	.	.	.	.	.	1	<DI>
8	831:43.52	14	.	1	.	.	.	1	<DI>
8	832:03.52	20	.	.	.	.	.	1	<DI>
8	832:23.52	18	.	.	.	.	.	1	<DI>
8	832:43.52	17	.	.	.	.	.	1	<DI>
8	833:03.52	26	.	.	.	.	.	1	<DI>



CURVE	MINIMUM	MAXIMUM
MIN	-2.6484E-01	4.3092E-01
AVG	2.1931E-02	1.2712E 02
MAX	1.0316E-01	1.0005E 03

Figure 15-3. Response Time For All Users Report

TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

DISTRIBUTION COLLECTED ON SYSTEM DSCC1 AT 0818:43.515 FRI 82-05-21. INITIAL GMC TAPE #1469

CPU TIMES ALLOCATED TO TS1-EXEC AND TS1-SUBDISPATCH

REPORT- 1

PLOT TIME REFERENCE	FIRST T70 TIME	LAST T70 TIME	NUMBER OF T70S	:	**** CPU SECONDS ATTRIBUTABLE TO THE FOLLOWING **** TS1-EXEC	TS1-SDSP	IDLE-TIME	OTHER-CPU	TOTAL	
0819:03.5	0818:43.5	0818:43.5	1	:	0.25	0.04	0.	0.01	0.30	----I
0819:23.5	0818:43.5	0819:17.0	2	:	0.73	0.04	65.73	0.70	67.21	I++++++
0819:43.5	0819:17.0	0819:23.7	1	:	0.40	0.01	12.58	0.34	13.33	------I
0820:03.5	0819:23.7	0819:48.3	1	:	0.35	0.02	48.37	0.38	49.12	I++
0820:23.5	0819:48.3	0820:12.7	1	:	0.36	0.02	48.27	0.36	49.01	I++
0820:43.5	0820:12.7	0820:30.7	1	:	0.19	0.01	35.33	0.47	35.99	-I
0821:03.5	0820:30.7	0820:55.5	1	:	0.21	0.01	48.92	0.42	49.56	I++
0821:23.5	0820:55.5	0821:19.2	2	:	0.74	0.24	45.72	0.66	47.35	I+
0821:43.5	0821:19.2	0821:43.1	2	:	0.65	0.09	46.53	0.66	47.93	I+
0822:03.5	0821:43.1	0822:03.2	11	:	0.99	0.07	32.74	6.52	40.33	I
0822:23.5	0822:03.2	0822:12.1	4	:	0.46	0.02	13.86	3.55	17.89	-----I
0822:43.5	0822:12.1	0822:38.1	1	:	0.34	0.02	50.69	0.38	51.43	I+++
0823:03.5										
0823:23.5	0822:38.1	0823:21.4	4	:	0.73	0.21	84.80	1.47	87.22	I***********
0823:43.5	0823:21.4	0823:42.1	3	:	1.17	0.24	39.09	1.07	41.57	I
0824:03.5	0823:42.1	0824:02.6	3	:	0.38	0.02	39.33	1.17	40.88	I
0824:23.5	0824:02.6	0824:07.0	1	:	0.16	0.00	8.28	0.36	8.81	-------I
0824:43.5	0824:07.0	0824:32.1	2	:	0.71	0.67	48.24	0.62	50.24	I++
0825:03.5	0824:32.1	0825:02.9	3	:	1.11	1.05	58.51	0.96	61.63	I+++++
0825:23.5	0825:02.9	0825:20.1	2	:	0.55	0.45	32.88	0.66	34.54	-I
0825:43.5	0825:20.1	0825:39.4	4	:	0.36	0.04	36.88	1.42	38.70	I
0826:03.5	0825:39.4	0826:01.4	8	:	1.74	5.53	34.47	2.30	44.04	I
0826:23.5	0826:01.4	0826:20.8	4	:	0.34	0.21	36.87	1.41	38.83	I
0826:43.5	0826:20.8	0826:42.2	6	:	1.01	2.52	37.46	1.87	42.86	I
0827:03.5	0826:42.2	0827:00.4	6	:	2.27	3.32	27.20	1.69	34.48	I
0827:23.5	0827:00.4	0827:14.8	2	:	0.66	0.94	28.53	0.61	30.75	--I
0827:43.5	0827:14.8	0827:40.4	1	:	0.24	0.01	50.59	0.41	51.26	I++
0828:03.5										
0828:23.5	0827:40.4	0828:06.5	1	:	0.25	0.19	51.47	0.38	52.29	I+++
0828:43.5	0828:06.5	0828:39.1	4	:	0.63	0.27	62.86	1.47	65.23	I++++++
0829:03.5	0828:39.1	0829:01.1	3	:	0.83	0.07	42.11	1.04	44.05	I
0829:23.5	0829:01.1	0829:23.1	2	:	0.81	0.05	42.59	0.65	44.08	I+
0829:43.5	0829:23.1	0829:40.8	5	:	1.19	0.27	31.66	2.23	35.35	-I
0830:03.5	0829:40.8	0830:02.4	13	:	0.83	0.03	32.85	9.81	43.52	I
0830:23.5	0830:02.4	0830:23.1	3	:	0.76	0.03	39.29	1.35	41.42	I
0830:43.5	0830:23.1	0830:41.2	5	:	0.73	0.96	32.05	2.43	36.17	I
0831:03.5	0830:41.2	0831:03.3	10	:	1.16	0.05	37.82	5.30	44.32	I+
0831:23.5	0831:03.3	0831:21.0	9	:	1.54	0.30	27.22	6.55	35.61	-I
0831:43.5	0831:21.0	0831:44.9	3	:	0.56	0.03	45.74	1.40	47.73	I+
0832:03.5	0831:44.9	0832:01.5	3	:	0.87	0.29	31.10	1.11	33.37	-I

Figure 15-4. CPU Times Allocated to Exec and Subdispatch Report

TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

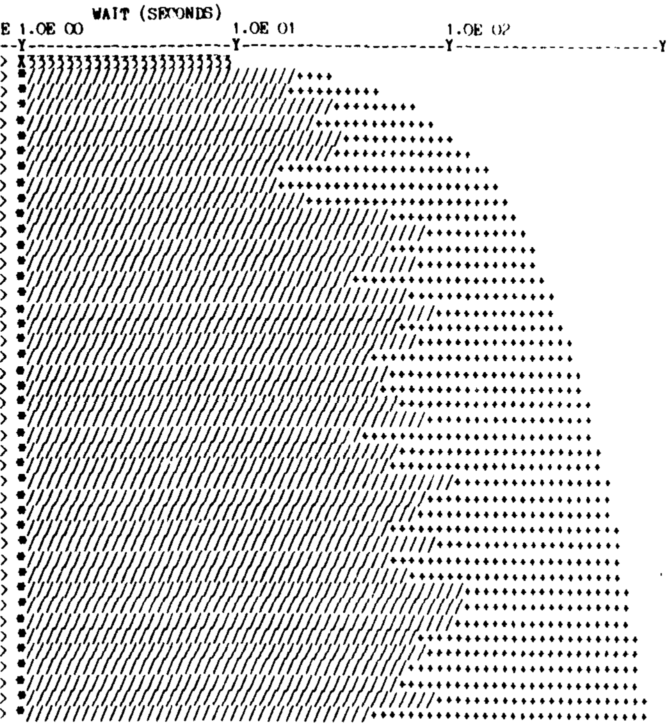
DISTRIBUTION COLLECTED ON SYSTEM DSCC1 AT 0818:43.515 FRI 82-05-21. INITIAL GMC TAPE #1469

RESPONSE TIME FOR USERS NOT REQUESTING MORE CORE

PLOT- 2

-= MIN /= AVG += MAX

USERS	TIME	WAITS IN INTERVAL (SEC) <1	<2	<4	<8	<16	<30	>30	LINE
4	819:03.52	.	.	.	.	3			<DI>
4	819:23.52	1	.	.	.	.	2		<DI>
4	819:43.52	4	.	.	.	.	.	2	<DI>
4	820:03.52	3	.	.	.	.	.	2	<DI>
4	820:23.52	6	.	.	.	.	.	2	<DI>
4	820:43.52	5	.	.	.	.	.	2	<DI>
4	821:03.52	7	.	.	.	.	.	2	<DI>
4	821:23.52	9	.	.	.	.	.	1	<DI>
4	821:43.52	10	.	.	.	.	.	1	<DI>
4	822:03.52	8	.	.	.	.	.	1	<DI>
4	822:23.52	3	.	.	.	.	.	1	<DI>
4	822:43.52	2	.	.	.	.	.	1	<DI>
4	823:03.52	4	.	.	.	.	.	1	<DI>
5	823:23.52	3	.	.	.	.	.	1	<DI>
5	823:43.52	7	.	.	.	.	.	1	<DI>
5	824:03.52	4	.	.	.	.	.	1	<DI>
6	824:23.52	3	.	.	.	.	.	1	<DI>
6	824:43.52	5	.	.	.	.	.	1	<DI>
6	825:03.52	4	.	.	.	.	.	1	<DI>
6	825:23.52	8	.	.	.	.	.	1	<DI>
6	825:43.52	7	.	.	.	.	.	1	<DI>
6	826:03.52	8	.	.	.	.	.	1	<DI>
6	826:23.52	7	.	.	.	.	.	1	<DI>
6	826:43.52	5	.	.	.	.	.	1	<DI>
7	827:03.52	12	.	.	.	.	.	1	<DI>
7	827:23.52	8	.	.	.	.	.	1	<DI>
7	827:43.52	9	.	.	.	.	.	1	<DI>
7	828:03.52	4	.	.	.	.	.	1	<DI>
7	828:23.52	6	.	.	.	.	.	1	<DI>
7	828:43.52	7	.	.	.	.	.	1	<DI>
8	829:03.52	11	.	.	.	.	.	1	<DI>
8	829:23.52	6	.	.	.	.	.	1	<DI>
8	829:43.52	11	.	.	.	.	.	1	<DI>
8	830:03.52	10	.	.	.	.	.	1	<DI>
8	830:23.52	5	.	.	.	.	.	1	<DI>
8	830:43.52	5	.	.	.	.	.	1	<DI>
8	831:03.52	6	.	.	.	.	.	1	<DI>
8	831:23.52	10	.	.	.	.	.	1	<DI>
8	831:43.52	9	.	.	.	.	.	1	<DI>
8	832:03.52	11	.	.	.	.	.	1	<DI>
8	832:23.52	13	.	.	.	.	.	1	<DI>
8	832:43.52	9	.	.	.	.	.	1	<DI>
8	833:03.52	19	.	.	.	.	.	1	<DI>



CURVE	MINIMUM	MAXIMUM
MIN	-2.6488E-01	9.5021E 00
AVG	5.6924E-03	2.9651E 02
MAX	1.5157E-02	1.0095E 03

Figure 15-5. Response Time For Users Not Requesting More Core Plot

```
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82
                         DISTRIBUTION COLLECTED ON SYSTEM DSCC1  AT   :3:43.515 FRI 82-05-21.  INITIAL GMC TAPE #1469

                    RESPONSE TIME FOR USERS WITH CORE REQUEST DURING LINE IDLE                    PLOT- 3
                                        -= MIN    /= AVG    += MAX

                  WAITS IN INTERVAL (SEC)                     WAIT (SECONDS)
USERS  TIME       <1  <2  <4  <8  <16  <30  >30  LINE 1.0E 00              1.0E 01              1.0E 02
-------------------------------------------------------Y--------------------Y--------------------Y--------------------Y
  4  819:03.52     1                             <TN> *
  4  819:23.52     5                             <TN> *
  4  819:43.52     3                             <TN> *
  4  820:03.52     3                             <TN> *
  4  820:23.52     2                             <TN> *
  4  820:43.52     1                             <TN> *
  4  821:03.52     3                             <TN> *
  4  821:23.52     7                             <TC> *
  4  821:43.52     2                             <TN> *
  4  822:03.52     2   1                         <TN> *++
  4  822:23.52     2                             <TN> *
  4  822:43.52                                        I
  4  823:03.52     1                             <TN> *
  5  823:23.52     5   1                         <TN> *+
  5  823:43.52     9                             <TC> *
  5  824:03.52     3                             <TC> *
  6  824:23.52     3                             <TK> *
  6  824:43.52     2   1                         <TK> *++
  6  825:03.52     1   1                         <TC> *
  6  825:23.52     3                             <TC> *
  6  825:43.52     1                             <TA> *
  6  826:03.52     1   1                         <TN> *+
  6  826:23.52     2                             <TN> *
  6  826:43.52     2                             <TN> *
  7  827:03.52    11   1                         <TN> *++++
  7  827:23.52     2                             <TK> *
  7  827:43.52                                        I
  7  828:03.52                                        I
  7  828:23.52     2                             <TK> *
  7  828:43.52     2                             <TK> *
  8  829:03.52     5                             <VV> *
  8  829:23.52     5                             <TK> *
  8  829:43.52     3   1                         <VV> *
  8  830:03.52     3                             <VV> *
  8  830:23.52     5                             <VV> *
  8  830:43.52     3   1                         <TK> *+
  8  831:03.52     7                             <CG> *
  8  831:23.52     8                             <TN> *
  8  831:43.52     5   .   1                     <TN> *+++++++++
  8  832:03.52     9                             <TN> *
  8  832:23.52     5                             <TC> *
  8  832:43.52     8                             <TK> *
  8  833:03.52     7                             <TK> *

   CURVE      MINIMUM       MAXIMUM
   MIN      -7.3665E-02    6.1448E-01
   AVG       6.4500E-02    4.5227E 00
   MAX       6.4500E-02    3.8571E 01
```

Figure 15-6. Response Time For Users With Core Requests During Line Idle Plot

```
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82
                              DISTRIBUTION COLLECTED ON SYSTEM DSCC1  AT 0818:43.515 FRI 82-05-21.  INITIAL GMC TAPE #1469


                                   TOTAL TIME IN SUBDISPATCH QUEUE                                              PLOT- 4

                                                             -= MIN    /= AVG    += MAX

                         QUEUE STATISTICS                             Q-TIME (MILLISEC)
USERS    TIME             #SD   CPU      TROUTS  I/O-BSY  LINE 1.0E-01    1.0E 00    1.0E 01    1.0E 02    1.0E 03    1.0E 04
                                                               Y----------Y----------Y----------Y----------Y----------Y----------Y
----------------------------------------------------------------------------
  4   819:03.52            9   19.31%    0.00%    0.00%  <TN> X-------------////+++
  4   819:23.52           64    8.03%    0.00%   37.50%  <CV> I22222222222222222+
  4   819:43.52           21   10.21%    0.00%   28.57%  <CV> I22222222222222222++
  4   820:03.52           63    7.74%    0.00%   76.19%  <CV> I22222222222222222+++
  4   820:23.52           15   10.35%    0.00%   26.67%  <TN> I22222222222222222+
  4   820:43.52            6   14.73%    0.00%   33.33%  <TN> I22222222222222222++
  4   821:03.52           18   15.37%    0.00%   33.33%  <TN> I-----------------/++
  4   821:23.52           96   29.50%    7.29%   28.13%  <TN> I-------------////////+++++++++++++++
  4   821:43.52           48   28.35%    0.00%   14.58%  <TN> I-----------------/+++++
  4   822:03.52          103   11.42%    0.00%   21.36%  <TN> I-------------////++
  4   822:23.52           51   13.32%    0.00%    5.88%  <TN> X-------------////++
  4   822:43.52           24    6.38%    0.00%   95.83%  <CV> I-------------////+
  4   823:03.52            7    6.75%    0.00%   14.29%  <TN> I-------------2222
  5   823:23.52           80   44.57%    0.00%    0.00%  <TN> I-------------/////+++
  5   823:43.52           83   42.55%    9.64%   22.89%  <TC> I-------------/////++++++++
  5   824:03.52           26   12.74%    0.00%   50.00%  <TC> I-------------////+++
  6   824:23.52           34    6.48%    0.00%   26.47%  <TK> I22222222222222222+
  6   824:43.52          116   71.73%   33.62%   32.76%  <TK> I-------------/////////++++++
  6   825:03.52          113   77.05%   39.82%   11.50%  <TK> I-------------/////////+++++
  6   825:23.52           50   27.25%    4.00%   72.00%  <TK> I-----------------/+++++++
  6   825:43.52           55   16.59%    0.00%   83.64%  <TA> X-------------////++++
  6   826:03.52          348   85.86%   75.00%    6.03%  <TN> I-------------///////////++++
  6   826:23.52           31   16.03%    0.00%   74.19%  <TA> I-------------////++
  6   826:43.52          219   84.74%   70.32%    0.91%  <TK> I-------------//////////+++++
  7   827:03.52          305   71.99%   31.80%   32.79%  <TN> I-------------/////////++++++
  7   827:23.52           90   78.76%   46.67%   27.78%  <TK> I-------------//////////+++
  7   827:43.52            8    7.02%    0.00%   12.50%  <TK> I-------------///++
  7   828:03.52            0    0.  %    0.  %    0.  %       I
  7   828:23.52           44   62.35%   20.45%   22.73%  <TK> I-------------////////++++
  7   828:43.52           42   61.57%   16.67%   50.00%  <TK> I-------------////////++++
  8   829:03.52           99   14.53%    0.00%   58.59%  <TA> X-------------////+++
  8   829:23.52           96   38.64%    0.00%   67.71%  <TN> I-------------/////++++++
  8   829:43.52          104   22.69%    0.00%   22.12%  <TN> I-------------/////+++++++
  8   830:03.52           58    9.26%    0.00%    6.90%  <TN> I-------------////++
  8   830:23.52           62   28.55%    4.84%   16.13%  <TK> I-------------/////++++++++
  8   830:43.52           80   77.83%   43.75%    1.25%  <TK> I-------------/////////+++++
  8   831:03.52          109    9.48%    0.00%   15.60%  <CG> I-------------////++
  8   831:23.52          166   31.30%    3.61%   19.88%  <TK> I-------------//////+++++++
  8   831:43.52           41   14.28%    0.00%   34.15%  <TA> I-------------////+++
  8   832:03.52          130   43.24%    1.54%   43.08%  <TC> I-------------//////++++++
  8   832:23.52           39    8.15%    0.00%   28.21%  <TC> X-------------////++++
  8   832:43.52          116   76.34%   41.38%   20.69%  <TN> I-------------//////////+++++
  8   833:03.52           82   23.79%    0.00%   24.39%  <TC> I-------------/////++++


CURVE      MINIMUM        MAXIMUM
MIN        1.1250E 00     4.0980E 00
AVG        3.2497E 00     8.3807E 01
MAX        4.1530E 00     9.2997E 03
```

Figure 15-7. Total Time In Subdispatch Queue Plot

```
... REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82
             DISTRIBUTION COLLECTED ON SYSTEM DSCC1  AT 0818:43.515 FRI 82-05-21.  INITIAL GMC TAPE #1469

                     TIME IN SUBDISPATCH QUEUE WAITING SERVICE                                              PLOT- 5

                                              -= MIN    /= AVG    += MAX

                        QUEUE STATISTICS                                  WAIT (MILLISEC)
USERS    TIME            #SD    CPU      TROUTS I/O-BSY  LINE 1.0E-01     1.0E 00    1.0E 01    1.0E 02    1.0E 03    1.0E 04
---------------------------------------------------------------Y----------Y----------Y----------Y----------Y----------Y----------Y
  4   819:03.52           9   19.31%    0.00%    0.00%  <TN> X------------////+
  4   819:23.52          64    8.03%    0.00%   37.50%  <TN> I---------------22
  4   819:43.52          21   10.21%    0.00%   28.57%  <CV> I---------------//+
  4   820:03.52          63    7.74%    0.00%   76.19%  <CV> I---------------//+++
  4   820:23.52          15   10.35%    0.00%   26.67%  <TN> I---------------22
  4   820:43.52           6   14.73%    0.00%   33.33%  <TN> I---------------22
  4   821:03.52          18   15.37%    0.00%   33.33%  <TN> I---------------//+
  4   821:23.52          96   29.50%    7.29%   28.13%  <TN> I-------------//////++++++++++++++++++
  4   821:43.52          48   28.35%    0.00%   14.58%  <TC> I---------------/+
  4   822:03.52         103   11.42%    0.00%   21.36%  <TN> I-------------////++
  4   822:23.52          51   13.32%    0.00%    5.88%  <TN> X--------------///++
  4   822:43.52          24    6.38%    0.00%   95.83%  <CV> I-------------////+
  4   823:03.52           7    6.75%    0.00%   14.29%  <TN> I--------------///+
  5   823:23.52          80   44.57%    0.00%    0.00%  <TN> I--------------///++
  5   823:43.52          83   42.55%    9.64%   22.89%  <TC> I-------------////++++++++
  5   824:03.52          26   12.74%    0.00%   50.00%  <TA> I------------////+
  6   824:23.52          34    6.48%    0.00%   26.47%  <TK> I---------------2
  6   824:43.52         116   71.73%   33.62%   32.76%  <TA> I--------------///++++++
  6   825:03.52         113   77.05%   39.82%   11.50%  <TK> I-------------////+++
  6   825:23.52          50   27.25%    4.00%   72.00%  <TK> I---------------//+++
  6   825:43.52          55   16.59%    0.00%   83.64%  <TA> X-------------////++++
  6   826:03.52         348   85.86%   75.00%    6.03%  <TN> I--------------//+++++++
  6   826:23.52          31   16.03%    0.00%   74.19%  <CV> I-------------////++
  6   826:43.52         219   84.74%   70.32%    0.91%  <TN> I-------------///++++++
  7   827:03.52         305   71.99%   31.80%   32.79%  <TN> I--------------///+++++
  7   827:23.52          90   78.76%   46.67%   27.78%  <TK> I-------------///+++
  7   827:43.52           8    7.02%    0.00%   12.50%  <TK> I-------------////+
  7   828:03.52           0    0.  %    0.  %    0.  %       I
  7   828:23.52          44   62.35%   20.45%   22.73%  <TK> I-------------////+
  7   828:43.52          42   61.57%   16.67%   50.00%  <TK> I--------------///+++++
  8   829:03.52          99   14.53%    0.00%   58.59%  <CG> X-------------////++++
  8   829:23.52          96   38.64%    0.00%   67.71%  <TN> I--------------///++
  8   829:43.52         104   22.69%    0.00%   22.12%  <VV> I--------------////++
  8   830:03.52          58    9.26%    0.00%    6.90%  <TN> I-------------/////++
  8   830:23.52          62   28.55%    4.84%   16.13%  <TK> I-------------/////+
  8   830:43.52          80   77.83%   43.75%    1.25%  <TK> I-------------////+++++++
  8   831:03.52         109    9.48%    0.00%   15.60%  <CG> I--------------////++
  8   831:23.52         166   31.30%    3.61%   19.88%  <TN> I--------------////+++++
  8   831:43.52          41   14.28%    0.00%   34.15%  <TN> I--------------///++
  8   832:03.52         130   43.24%    1.54%   43.08%  <TA> I--------------///++
  8   832:23.52          39    8.15%    0.00%   28.21%  <TC> X--------------////++++
  8   832:43.52         116   76.34%   41.38%   20.69%  <TN> I--------------///+++
  8   833:03.52          82   23.79%    0.00%   24.39%  <TK> I--------------///++++

   CURVE        MINIMUM        MAXIMUM
   MIN         9.5400E-01     3.9000E 00
   AVG         2.7024E 00     8.0279E 01
   MAX         3.8150E 00     9.2758E 03
```

Figure 15-8. Total Time In Subdispatch Queue Waiting Service Plot

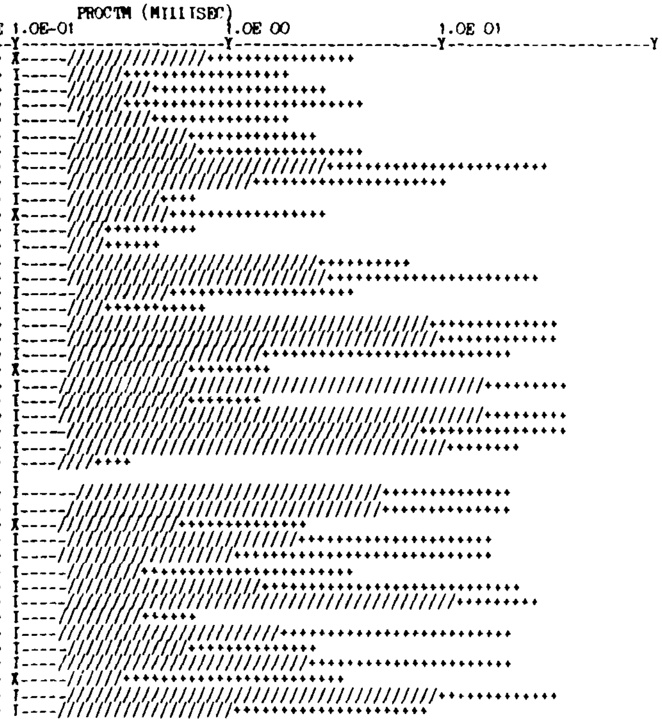
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

DISTRIBUTION COLLECTED ON SYSTEM DSCC1 AT 0818:43.515 FRI 82-05-21. INITIAL GMC TAPE #1469

PROCESSOR TIME IN SUBDISPATCH PLOT- 6

-= MIN /= AVG += MAX

USERS	TIME	QUEUE STATISTICS #SD	CPU	TROUTS	I/O-BSY	LINE
4	819:03.52	9	19.31%	0.00%	0.00%	<TN>
4	819:23.52	64	8.03%	0.00%	37.50%	<CV>
4	819:43.52	21	10.21%	0.00%	28.57%	<TN>
4	820:03.52	63	7.74%	0.00%	76.19%	<TN>
4	820:23.52	15	10.35%	0.00%	26.67%	<TN>
4	820:43.52	6	14.73%	0.00%	33.33%	<TN>
4	821:03.52	18	15.37%	0.00%	33.33%	<TN>
4	821:23.52	96	29.50%	7.29%	28.13%	<TC>
4	821:43.52	48	28.35%	0.00%	14.58%	<TN>
4	822:03.52	103	11.42%	0.00%	21.36%	<TN>
4	822:23.52	51	13.32%	0.00%	5.88%	<TN>
4	822:43.52	24	6.38%	0.00%	95.83%	<CV>
4	823:03.52	7	6.75%	0.00%	14.29%	<TN>
5	823:23.52	80	44.57%	0.00%	0.00%	<TN>
5	823:43.52	83	42.55%	9.64%	22.89%	<TC>
5	824:03.52	26	12.74%	0.00%	50.00%	<TC>
6	824:23.52	34	6.48%	0.00%	26.47%	<TK>
6	824:43.52	116	71.[illegible]%	33.62%	32.76%	<TK>
6	825:03.52	113	77.0[illegible]%	39.82%	11.50%	<TK>
6	825:23.52	50	27.25%	4.00%	72.00%	<TK>
6	825:43.52	55	16.59%	0.00%	83.64%	<TA>
6	826:03.52	348	85.86%	75.00%	6.03%	<TN>
6	826:23.52	31	16.03%	0.00%	74.19%	<TA>
6	826:43.52	219	84.74%	70.32%	0.91%	<TK>
7	827:03.52	305	71.99%	31.80%	32.79%	<TN>
7	827:23.52	90	78.76%	46.67%	27.78%	<TK>
7	827:43.52	8	7.02%	0.00%	12.50%	<TK>
7	828:03.52	0	0. %	0. %	0. %	
7	828:23.52	44	62.35%	20.45%	22.73%	<TK>
7	828:43.52	42	61.57%	16.67%	50.00%	<TK>
8	829:03.52	99	14.53%	0.00%	58.59%	<VV>
8	829:23.52	96	38.64%	0.00%	67.71%	<TN>
8	829:43.52	104	22.69%	0.00%	22.12%	<TN>
8	830:03.52	58	9.26%	0.00%	6.90%	<TN>
8	830:23.52	62	28.55%	4.84%	16.13%	<TK>
8	830:43.52	80	77.93%	43.75%	1.25%	<TK>
8	831:03.52	109	9.48%	0.00%	15.60%	<TN>
8	831:23.52	166	31.30%	3.61%	19.88%	<CV>
8	831:43.52	41	14.29%	0.00%	34.15%	<TA>
8	832:03.52	130	43.24%	1.54%	43.08%	<TC>
8	832:23.52	39	8.15%	0.00%	28.21%	<CV>
8	832:43.52	116	76.34%	41.38%	20.69%	<TN>
8	833:03.52	82	23.79%	0.00%	24.39%	<TC>



CURVE	MINIMUM	MAXIMUM
MIN	1.5600E-01	1.8700E-01
AVG	2.2800E-01	1.6408E 01
MAX	3.4300E-01	4.0156E 01

Figure 15-9. Processor Time In Subdispatch Plot

TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

DISTRIBUTION COLLECTED ON SYSTEM DSCC1 AT 0818:43.515 FRI 82-05-21. INITIAL GMC TAPE #1469

TSS SUBTRACES ENCOUNTERED (LOW HALF)

INDIV. NUMBER	CUMUL. NUMBER	CUMUL. PRC	INDIV. PRC	TSS SUBTRC		PERCENT OF OCCURRENCE 00 05 10 15 20 25 30 35 40 45 50	HISTOGRAM 1
70	70	0.006	0.006	1-	1	I	LOG-ON COMPLETE
0	70	0.006	0.	2-	2	I	SWAP SPACE DENIED
187	257	0.024	0.017	3-	3	I	PAT DENIAL
719	976	0.089	0.066	4-	4	I	GEFSYE DEALLOCATE
719	1695	0.155	0.066	5-	5	I	DEALLOC COMPLETE
7	1702	0.156	0.001	6-	6	I	ERROR MESSAGE
1564	3266	0.299	0.143	7-	7	I	POPUP PRIMITIVE
2207	5473	0.500	0.202	8-	8	I	CALLP PRIMITIVE
928	6401	0.585	0.085	9-	9	I	ENTER BUILD MODE
1801	8202	0.750	0.165	10-	10	I	EXEC PRIMITIVE
117	8319	0.761	0.011	11-	11	I	SYSTM PRIMITIVE
53	8372	0.766	0.005	12-	12	I	LOG-OFF
1237	9609	0.879	0.113	13-	13	I	COMMAND RECEIVED
9705	19314	1.766	0.887	14-	14	IX	PERIODIC CHECK
0	19314	1.766	0.	15-	15	I	GEWAKE NO USERS
53	19367	1.771	0.005	16-	16	I	BREAK/DISCONNECT
5160	24527	2.243	0.472	17-	17	I	GEWAKE S/D DONE
156686	181213	16.570	14.327	18-	18	IXXXXXXXXXXXXXX	GEWAKE S/D BUSY
307	181520	16.598	0.028	19-	19	I	APB RIO C/C
1083	182603	16.697	0.099	20-	20	I	BUILD INPUT REC
58	182661	16.703	0.005	21-	21	I	SY** I/O COMPLETE
14	182675	16.704	0.001	22-	22	I	RECONNECT MODE
95117	277792	25.401	8.698	23-	23	IXXXXXXXXX	PROCESS DRL
31902	309694	28.319	2.917	24-	24	IXXX	REQUEST FILE I/O
29583	339277	31.024	2.705	25-	25	IXXX	DISK I/O COMPLETE
0	339277	31.024	0.	26-	26	I	DRL DEFIL DENIAL
1755	341032	31.184	0.160	27-	27	I	ISSUE MME GEFSYE
187	341219	31.201	0.017	28-	28	I	BAD FILACT PARAM
1755	342974	31.362	0.160	29-	29	I	GEFSYE/27 COMPLETE
52	343026	31.367	0.005	30-	30	I	DELAY 200 MS
36	343062	31.370	0.003	31-	31	I	DELAY 2 SEC
70	343132	31.376	0.006	32-	32	I	STORE USERID
20	343152	31.378	0.002	33-	33	I	PASUST -1 COMP
0	343152	31.378	0.	34-	34	I	DRL MORLNK ERROR
91	343243	31.386	0.008	35-	35	I	SPAWN I/O COMPLETE
91	343334	31.395	0.008	36-	36	I	BATCH JOB
0	343334	31.395	0.	37-	37	I	DRL SPAWN ERROR
7	343341	31.395	0.001	38-	38	I	WRITE ABRT
4	343345	31.396	0.000	39-	39	I	ABRT I/O COMPLETE
91	343436	31.404	0.008	40-	40	I	EXEC* - DRL R[illegible]OR
91	343527	31.412	0.008	41-	41	I	LOAD DRL RESTOR
376	343903	31.447	0.034	42-	42	I	RESTOR LOAD COMPL
928	344831	31.532	0.085	43-	43	I	PERM I/O RESTOR
4	344835	31.532	0.000	44-	44	I	START LINE SWITCH
15	344850	31.533	0.001	45-	45	I	FILE GROW .MFS19
15	344865	31.535	0.001	46-	46	I	GROW COMPLETE
0	344865	31.535	0.	47-	47	I	CONSOLE I/O
34	344899	31.538	0.003	48-	48	I	DRL JOUT RETURN
0	344899	31.538	0.	49-	49	I	JOUT OUTPUT BUSY
2728	347627	31.787	0.249	50-	50	I	START GWAKE
0	347627	31.787	0.	51-	51	I	*J WRITE - TASK
0	347627	31.787	0.	52-	52	I	START DRL TASK
0	347627	31.787	0.	53-	53	I	*J READ - TASK
3	347630	31.788	0.000	54-	54	I	DRL SAVE COMPLETE

1093606 ENTRIES TOTAL   745976 OUT OF RANGE

Figure 15-10. TSS Subtraces Encountered Histogram
(Part 1 of 2)

TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

DISTRIBUTION COLLECTED ON SYSTEM DSCC1 AT 0818:43.515 FRI 82-05-21. INITIAL GMC TAPE #1469

TSS SUBTRACES ENCOUNTERED (HIGH HALF)

INDIV. NUMBER	CUMUL. NUMBER	CUMUL. PRC	INDIV. PRC	TSS SUBTRC	PERCENT OF OCCURRENCE 00 05 10 15 20 25 30 35 40 45 50	HISTOGRAM 2
347630	347630	31.787	31.787	1- 54	IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	DRI SAVE COMPLETE
15	347645	31.789	0.001	55- 55	I	IDS ATTRI .MFS13
15	347660	31.790	0.001	56- 56	I	IDS ATTRI STATUS
0	347660	31.790	0.	57- 57	I	DRI T.SYOT DENIAL
3	347663	31.791	0.000	58- 58	I	UST SWITCH T.CONN
0	347663	31.791	0.	59- 59	I	TAP* I/O COMPLETE
68443	416106	38.049	6.258	60- 60	IXXXXXX	ALLOCATOR SERVICES
259546	675652	61.782	23.733	61- 61	IXXXXXXXXXXXXXXXXXXXXXXX	ENTER PROC ALLOC
34996	710648	64.982	3.200	62- 62	IXXX	ENTER MEMORY ALLOC
1206	711854	65.092	0.110	63- 63	I	ENTER SWAP DECIS
9200	721054	65.934	0.841	64- 64	IX	NEXT PRIMITIVE IS
5	721059	65.934	0.000	65- 65	I	CONSIDER TSS INCR
3	721062	65.934	0.000	66- 66	I	INITIATE SIZE INCR
9	721071	65.935	0.001	67- 67	I	SET UP FENCE
1	721072	65.935	0.000	68- 68	I	MEMORY RESERVE
12	721084	65.936	0.001	69- 69	I	FORCE SWAP
0	721084	65.936	0.	70- 70	I	TERMINATE SWAP
10	721094	65.937	0.001	71- 71	I	TSSI UST AREA +1K
7	721101	65.938	0.001	72- 72	I	GEMORE MEMORY
5	721106	65.938	0.000	73- 73	I	GEMORE SUCCESSFUL
3	721109	65.939	0.000	74- 74	I	MEMORY RELEASE
137	721246	65.951	0.013	75- 75	I	GEMORE REFUSED
12	721258	65.952	0.001	76- 76	I	CANCEL CRUN
9709	730967	66.840	0.888	77- 77	IX	ATTEMPT MEM ALLOC
23932	754899	69.028	2.188	78- 78	IXX	MEM MAP CHANGE
7218	762117	69.688	0.660	79- 79	IX	SWAP PROGRAM
48418	810535	74.116	4.427	80- 80	IXXXX	TIME TYPES
2646	813181	74.358	0.242	81- 81	I	REQUEST EBM
896	814077	74.440	0.082	82- 82	I	SCAN COMMAND LIST
62	814139	74.445	0.006	83- 83	I	EBM REFUSED
3124	817263	74.731	0.286	84- 84	I	INPUT COMPLETE
632	817895	74.789	0.058	85- 85	I	POPUP TO CALLSS
17	817912	74.790	0.002	86- 86	I	APB COMPLETE
11195	829107	75.814	1.024	87- 87	IX	TERM I/O COMPLETE
97904	927011	84.766	8.952	88- 88	IXXXXXXXXX	S/D FAULT QUEUE
11909	938920	85.855	1.089	89- 89	IX	PROCESS .CRTSQ
5	938925	85.856	0.000	90- 90	I	TRACE ON/OFF
97905	1036830	94.808	8.952	91- 91	IXXXXXXXXX	MAKE S/D ENTRY
70	1036900	94.815	0.006	92- 92	I	LOG-ON REQUEST
0	1036900	94.815	0.	93- 93	I	BAD LINE STATUS
67	1036967	94.821	0.006	94- 94	I	CHECK VIP TERM TYP
3	1036970	94.821	0.000	95- 95	I	UST WAIT TIME
0	1036970	94.821	0.	96- 96	I	REJECT USER
73	1037043	94.828	0.007	97- 97	I	UST COMPRESSION
4	1037047	94.828	0.000	98- 98	I	TSSN UST AREA +1K
5	1037052	94.829	0.000	99- 99	I	UST AREA -1K
18549	1055601	96.525	1.696	100- 100	IXX	TERMINAL I/O
93	1055694	96.533	0.009	101- 101	I	CRUN $*$ FUNC
67	1055761	96.539	0.006	102- 102	I	REMOTE INQUIRY
268	1056029	96.564	0.025	103- 103	I	VIP INPUT COMPLETE
37577	1093606	100.000	3.436	104- 104	IXXX	DRI COMPLETE

1093606 ENTRIES TOTAL   0 OUT OF RANGE

Figure 15-10. (Part 2 of 2)

TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

DISTRIBUTION COLLECTED ON SYSTEM DSCC1 AT 0818:43.515 FRI 82-05-21. INITIAL GMC TAPE #1469

DERAILS (LOW HALF)

INDIV. NUMBER	CUMUL. NUMBER	CUMUL. PRC	INDIV. PRC	TSS DRI	#	PERCENT OF OCCURRENCE 00 05 10 15 20 25 30 35 40 45 50 I....I....I....I....I....I....I....I....I....I....I	HISTOGRAM 3
11	11	0.012	0.012	-4-	-4	I	W.PSZ
210	221	0.232	0.221	-3-	-3	I	W.STOR
0	221	0.232	0.	-2-	-2	I	W.BRCH
208	429	0.451	0.219	-1-	-1	I	W.USER
0	429	0.451	0.	0-	0	I	ZERO
28939	29368	30.876	30.425	1-	1	IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	DIO
12469	41837	43.985	13.109	2-	2	IXXXXXXXXXXXXX	KOUT
3136	44973	47.282	3.297	3-	3	IXXX	KOUTN
4578	49551	52.095	4.813	4-	4	IXXXXX	KIN
1565	51116	53.740	1.645	5-	5	IXX	RETURN
1882	52998	55.719	1.979	6-	6	IXX	DEFIL
0	52998	55.719	0.	7-	7	I	ABORT
1383	54381	57.173	1.454	8-	8	IX	SETSWH
294	54675	57.482	0.309	9-	9	I	RSTSWH
3604	58279	61.271	3.789	10-	10	IXXXX	REW
443	58722	61.737	0.466	11-	11	I	FILSP
1616	60338	63.436	1.699	12-	12	IXX	RETFIL
179	60517	63.624	0.188	13-	13	I	RELMEM
216	60733	63.851	0.227	14-	14	I	ADDMEM
128	60861	63.985	0.135	15-	15	I	CORFIL
98	60959	64.088	0.103	16-	16	I	SNUMB
13594	74553	78.380	14.292	17-	17	IXXXXXXXXXXXXXX	TIME
74	74627	78.458	0.078	18-	18	I	PASAFT
419	75046	78.899	0.441	19-	19	I	TERMTP
774	75820	79.712	0.814	20-	20	IX	PDIO
376	76196	80.108	0.395	21-	21	I	RESTOR
96	76292	80.209	0.101	22-	22	I	SPAWN
0	76292	80.209	0.	23-	23	I	TAPEIN
763	77055	81.011	0.802	24-	24	IX	CALLSS
70	77125	81.084	0.074	25-	25	I	USERID
54	77179	81.141	0.057	26-	26	I	TERMPG
2198	79377	83.452	2.311	27-	27	IXX	PASUST
5	79382	83.457	0.005	28-	28	I	MORLNK

95117 ENTRIES TOTAL 15735 OUT OF RANGE

Figure 15-11. Derails Executed By User Histogram (Part 1 of 2)

TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

DISTRIBUTION COLLECTED ON SYSTEM DSCC1 AT 0818:43.515 FRI 82-05-21. INITIAL GMC TAPE #1469

DERAILS (HIGH HALF)

INDIV. NUMBER	CUMUL. NUMBER	CUMUL. PRC	INDIV. PRC	TSS DRI	#	PERCENT OF OCCURRENCE 00 10 20 30 40 50 60 70 80 90 100 I....I....I....I....I....I....I....I....I....I....I	HISTOGRAM 4
79382	79382	83.457	83.457	-4-	28	IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	MORLNK
0	79382	83.457	0.	29-	29	I	NEWUSR
1948	81330	85.505	2.048	30-	30	IX	FILACT
5	81335	85.510	0.005	31-	31	I	SETINO
0	81335	85.510	0.	32-	32	I	SYSRET
0	81335	85.510	0.	33-	33	I	STPSYS
0	81335	85.510	0.	34-	34	I	STATUS
81	81416	85.596	0.085	35-	35	I	DRIDSC
157	81573	85.761	0.165	36-	36	I	PASDES
3054	84627	88.974	3.211	37-	37	IXX	JSTS
71	84698	89.046	0.075	38-	38	I	CGROUT
14	84712	89.061	0.015	39-	39	I	PART
43	84755	89.106	0.045	40-	40	I	GROW
0	84755	89.106	0.	41-	41	I	ABTJOB
0	84755	89.106	0.	42-	42	I	CONSOI
401	85156	89.528	0.422	43-	43	I	SWITCH
0	85156	89.528	0.	44-	44	I	DRLIMT
463	85619	90.014	0.487	45-	45	I	JOUT
1103	86722	91.174	1.160	46-	46	IX	KOTNOW
233	86955	91.419	0.245	47-	47	I	OBJTIM
55	87010	91.477	0.058	48-	48	I	PASFIR
0	87010	91.477	0.	49-	49	I	STOPPT
1	87011	91.478	0.001	50-	50	I	DRISAV
0	87011	91.478	0.	51-	51	I	TASK
4038	91049	95.723	4.245	52-	52	IXX	PSEUDO
313	91362	96.052	0.329	53-	53	I	PRGDES
2980	94342	99.185	3.133	54-	54	IXX	GWAKE
7	94349	99.193	0.007	55-	55	I	T.CRYP
15	94364	99.208	0.016	56-	56	I	ATTRI
8	94372	99.217	0.008	57-	57	I	T.STAT
238	94610	99.467	0.250	58-	58	I	T.GOTO
233	94843	99.712	0.245	59-	59	I	T.CMOV
5	94848	99.717	0.005	60-	60	I	T.LINL
0	94848	99.717	0.	61-	61	I	T.SYOT
3	94851	99.720	0.003	62-	62	I	T.CONN
125	94976	99.852	0.131	63-	63	I	T.CFIO
0	94976	99.852	0.	64-	64	I	T.EXEC
0	94976	99.852	0.	65-	65	I	T.RSCC
0	94976	99.852	0.	66-	66	I	T.MAIL
141	95117	100.000	0.148	67-	67	I	T.ERR

95117 ENTRIES TOTAL 0 OUT OF RANGE

Figure 15-11. (Part 2 of 2)

```
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82
                         DISTRIBUTION COLLECTED ON SYSTEM DSC01  AT 0818:33.201 FRI 82-05-21.  INITIAL GMC TAPE #1469

                                   EXCEPTION MESSAGE REPORT

TOD & RECNO           EXCEPTION MESSAGE
-------------------- ---------------------------------------------
0818:56.604*     43 LINE <TN>, USERID PRC104      :: SWAP SPACE DENIED.
0818:56.605      45 LINE <TN>, USERID PRC104      :: JOUT OUTPUT BUSY.
0818:56.610*     49 LINE <TN>, USERID PRC104      :: CANNOT SWAP.
0818:56.693*     55 LINE <TN>, USERID PRC104      :: I/O ERROR ON DEVICE.
0818:56.700      61 LINE <TN>, USERID PRC104      :: UNDEFINED DEVICE.
0818:56.770      73 LINE <TN>, USERID PRC104      :: SEEK ERROR.
0818:56.790      85 LINE <TN>, USERID PRC104      :: FAILURE IN NAME SCAN.
0818:56.854     105 LINE <TN>, USERID PRC104      :: BAD SPACE INVENTORY.
0818:56.926     111 LINE <TN>, USERID PRC104      :: BAD SPACE TABLE.
0818:56.933*    117 LINE <TN>, USERID PRC104      :: UNACCOUNTABLE ERROR 1.
0818:56.934*    121 LINE <TN>, USERID PRC104      :: CHECKSUM ERROR.
0818:56.935     123 LINE <TN>, USERID PRC104      :: PAGE REQUEST DEADLOCK.
0818:56.937*    127 LINE <TN>, USERID PRC104      :: UNACCOUNTABLE ERROR 2.
0818:57.053     133 LINE <TN>, USERID PRC104      :: BAD PRIMITIVE.
0818:57.060*    139 LINE <TN>, USERID PRC104      :: BAD PROGRAM DESCRIPTOR.
0819:08.916*    198 LINE <TN>, USERID PRC104      :: LOOP IN PRIMITIVES.
0819:08.917     200 LINE <TN>, USERID PRC104      :: PROGRAM TOO LARGE TO SWAP.
0819:08.918*    202 LINE <TN>, USERID PRC104      :: BAD STATUS - SWAP OUT.
0819:09.045*    204 LINE <TN>, USERID PRC104      :: BAD STATUS - SWAP IN.
0819:09.049*    208 LINE <TN>, USERID PRC104      :: BAD STATUS - LOAD.
0819:09.110     214 LINE <TN>, USERID PRC104      :: ERROR IN WRITING TAP*.
0819:09.116*    220 LINE <TN>, USERID PRC104      :: NOT ENOUGH CORE TO RUN PROGRAM.
0819:09.259*    222 LINE <TN>, USERID PRC104      :: OUT OF SWAP SPACE.
0819:09.264*    226 LINE <TN>, USERID PRC104      :: SY** I/O ERROR.
0819:09.305     238 LINE <TN>, USERID PRC104      :: DRL DEFIL - NO FILE SPACE.
0819:09.358*    250 LINE <TN>, USERID PRC104      :: DRL DEFIL - NO PAT SPACE.
0819:09.360     252 LINE <TN>, USERID PRC104      :: DRL MORLNK - NO FILE SPACE.
0819:09.411     254 LINE <TN>, USERID PRC104      :: DRL MORLNK - PAT FULL.
0819:09.412     256 LINE <TN>, USERID PRC104      :: DRL JOUT - BATCH SYSTEM FULL.
0819:09.416*    260 LINE <TN>, USERID PRC104      :: DRL JOUT - LOST PAT.
0819:12.996*    314 LINE <CV>, USERID PRC105      :: DRL SPAWN - NO PAT.
0819:12.997*    316 LINE <CV>, USERID PRC105      :: DRL SPAWN - NO PROGRAM NO.
0819:12.998*    318 LINE <CV>, USERID PRC105      :: DRL SPAWN - SCHEDULER QUEUE FULL.
0819:13.114*    320 LINE <CV>, USERID PRC105      :: DRL TASK - NO PROGRAM NO.
0819:13.119     324 LINE <CV>, USERID PRC105      :: DRL TASK - BAD *J STATUS.
0819:13.225*    334 LINE <CV>, USERID PRC105      :: DRL TASK - NO PUSHDOWN FILE.
0819:13.232     340 LINE <CV>, USERID PRC105      :: DRL T.SYOT - SYSTEM LOADED.
0819:13.440     342 LINE <CV>, USERID PRC105      :: DRL T.SYOT - BACKDOOR FILE NOT CONFIGD.
0819:13.444*    346                               :: GEMORE DENIED.
0819:13.528     360 LINE <CV>, USERID PRC105      :: CPU HOG?  CPS SINCE SWAPIN =
```

Figure 15-12. Exception Message Report

```
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

                 DISTRIBUTION COLLECTED ON SYSTEM DSCCI  AT 0818:33.201 FRI 82-05-21.  INITIAL GMC TAPE #1469

                                USERS MAP

*****************************************************REASON FOR FOLLOWING MAP*************************************************
0818:56.604*        43 LINE <TN>, USERID PRC104         :: SWAP SPACE DENIED.
-------------------------------------------------------------------------------------------------------------------------------

 USR USTOCT  LID USER-ID----- TIME-IN:STATE TRMIO LAST-TRACE------------ADERAIL--- SIZE  PROGRAM-STACK------------
 --- ------ ---- ------------ ------- ----- ----- ---------------------- --------- ----  -----------------------
   1 065060 <TN> PRC104             0 WTSUB       88 S/D FAULT QUEUE       0 ZERO      2KT NONE CMDI
   2 063530 <DI> MASB            2591 UNKWN       90 TRACE ON/OFF          0 ZERO      1K  NONE
   3 063230 <CV> PRC105          2591 UNKWN       90 TRACE ON/OFF          0 ZERO      1K  NONE
   4 062730 <TC> C721            2591 UNKWN       90 TRACE ON/OFF          0 ZERO      1K  CARD

*****************************************************REASON FOR FOLLOWING MAP*************************************************
0818:56.610*        49 LINE <TN>, USERID PRC104         :: CANNOT SWAP.
-------------------------------------------------------------------------------------------------------------------------------

 USR USTOCT  LID USER-ID----- TIME-IN:STATE TRMIO LAST-TRACE------------ADERAIL--- SIZE  PROGRAM-STACK------------
 --- ------ ---- ------------ ------- ----- ----- ---------------------- --------- ----  -----------------------
   1 065060 <TN> PRC104             0 WTSUB       88 S/D FAULT QUEUE      27 PASUST    2KT NONE CMDI
   2 063530 <DI> MASB            2597 UNKWN       90 TRACE ON/OFF          0 ZERO      1K  NONE
   3 063230 <CV> PRC105          2597 UNKWN       90 TRACE ON/OFF          0 ZERO      1K  NONE
   4 062730 <TC> C721            2597 UNKWN       90 TRACE ON/OFF          0 ZERO      1K  CARD

*****************************************************REASON FOR FOLLOWING MAP*************************************************
0818:56.693*        55 LINE <TN>, USERID PRC104         :: I/O ERROR ON DEVICE.
-------------------------------------------------------------------------------------------------------------------------------

 USR USTOCT  LID USER-ID----- TIME-IN:STATE TRMIO LAST-TRACE------------ADERAIL--- SIZE  PROGRAM-STACK------------
 --- ------ ---- ------------ ------- ----- ----- ---------------------- --------- ----  -----------------------
   1 065060 <TN> PRC104             0 WTSUB       29 GEFSYE/27 COMPLETE   30 FILACT    2KT NONE CMDI
   2 063530 <DI> MASB            2680 UNKWN       90 TRACE ON/OFF          0 ZERO      1K  NONE
   3 063230 <CV> PRC105          2680 UNKWN       90 TRACE ON/OFF          0 ZERO      1K  NONE
   4 062730 <TC> C721            2680 UNKWN       90 TRACE ON/OFF          0 ZERO      1K  CARD

*****************************************************REASON FOR FOLLOWING MAP*************************************************
0818:56.933*       117 LINE <TN>, USERID PRC104         :: UNACCOUNTABLE ERROR 1.
-------------------------------------------------------------------------------------------------------------------------------

 USR USTOCT  LID USER-ID----- TIME-IN:STATE TRMIO LAST-TRACE------------ADERAIL--- SIZE  PROGRAM-STACK------------
 --- ------ ---- ------------ ------- ----- ----- ---------------------- --------- ----  -----------------------
   1 065060 <TN> PRC104             0 WTSUB       88 S/D FAULT QUEUE      12 RETFIL    2KT NONE CMDI
   2 063530 <DI> MASB            2920 UNKWN       90 TRACE ON/OFF          0 ZERO      1K  NONE
   3 063230 <CV> PRC105          2920 UNKWN       90 TRACE ON/OFF          0 ZERO      1K  NONE
   4 062730 <TC> C721            2920 UNKWN       90 TRACE ON/OFF          0 ZERO      1K  CARD

*****************************************************REASON FOR FOLLOWING MAP*************************************************
0818:56.934*       121 LINE <TN>, USERID PRC104         :: CHECKSUM ERROR.
-------------------------------------------------------------------------------------------------------------------------------

 USR USTOCT  LID USER-ID----- TIME-IN:STATE TRMIO LAST-TRACE------------ADERAIL--- SIZE  PROGRAM-STACK------------
 --- ------ ---- ------------ ------- ----- ----- ---------------------- --------- ----  -----------------------
   1 065060 <TN> PRC104             0 WTSUB      104 DRL COMPLETE         13 RELMEM    2KT NONE CMDI
   2 063530 <DI> MASB            2921 UNKWN       90 TRACE ON/OFF          0 ZERO      1K  NONE
   3 063230 <CV> PRC105          2921 UNKWN       90 TRACE ON/OFF          0 ZERO      1K  NONE
   4 062730 <TC> C721            2921 UNKWN       90 TRACE ON/OFF          0 ZERO      1K  CARD
```

Figure 15-13. Users Map

```
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

                    DISTRIBUTION COLLECTED ON SYSTEM DSCC1  AT 0818:33.201 FRI 82-05-21.  INITIAL GMC TAPE #1469

                                   TSS DELAY REPORT --- USER DELAY REPORT

                     *-TSS DELAYED--  --POSSIBLE REASON & TRACE-*:*--USER DELAYED IN VULNERABLE STATE (:) OR USERS SNAPSHOT (>)---  *
TOD             RCNT  DLAY  PRV,CUR  XEC  DRI  --FMS--  USR-I/O : UST LINE USERID------ DLAY STATE T PRV DERAIL SIZE PROGRAM STACK--
------------ -------  ----  -------  ---  ---  -------  ------- : ---- ---- ------------ ---- ------- --- ------ ---- ---------------
0823:05.297     6371             61                             :    1 <TN> PRC104          1 DRISR     60 JOUT     8K NONE JOUT
0823:05.299     6375             91                             :    1 <TN> PRC104          1 DRISR+    60 JOUT     8K NONE JOUT
0831:32.618    30344             61                             :    1 <TN> PRC104          3 DRISR     60 JOUT     8K NONE JOUT
0831:32.620    30348             91                             :    1 <TN> PRC104          3 DRISR+    60 JOUT     8K NONE JOUT
0845:03.892    73475     1   18, 61   18
                                                                >   10 <3X> IRCNTI          1 IDLME *   80 T.GOTO   5K TSEC
                                                                >    9 <TX> SSISM           1 IBUSY *   78 KOUTN   34K RUNY
                                                                >    8 <CG> WSSIB          41 IBUSY *  100 RETURN   1K NONE*
                                                                >    7 <VV> C722           33 IBUSY *   78 KOUTN   26K NONE CMDI
                                                                >    6 <TK> C433            1 WTMEM    100 GWAKE    1K NONE CMDI
                                                                >    5 <TA> HIS8010        12 IBUSY *  100 KOUTN    5K NONE CMDI
                                                                >    1 <TN> PRC104          2 IBUSY *   78 KOUTN    8K NONE JOUT
                                                                >    2 <DT> MASB          556 NOTSS    100 CGROUT  12K NONE JDAC
                                                                >    3 <CV> PRC105          5 IBUSY *  100 KOUTN   11K CARD EDTX
                                                                >    4 <TC> C721           43 IBUSY *  100 KOUTN   11K NONE EDTX
0846:03.890    84574             29*                            :   12 <T3> CSC             1 FMSER     60 FILACT   5K NONE CMDI
0847:07.558    95739             61                             :   11 <DN> HIS             2 DRISR     60 JOUT     8K NONE GRUN JOUT
0847:07.567    95749             91                             :   11 <DN> HIS             2 DRISR+   100 JOUT     8K NONE GRUN JOUT
0848:44.024*  100696             77                             :   11 9595 CSC             4 WTMEM     78 KOUTN    5K TSEC
0848:44.024*  100698             80                             :   11 9595 CSC             4 WTMEM+    78 KOUTN    3K TSEC
0852:37.491   115212     6   23,104                             :   10 <3X> IRCNTI          6 DRISR     87 DEFIL   38K MDQ  CMDI
                                                                >   13 <T2> PRC101         63 GWAKE    100 GWAKE    1K EDTX FRN  RUNY
                                                                >   12 <T3> CSC            12 IBUSY *   78 KOUTN    5K NONE CMDI
                                                                >   10 <3X> IRCNTI          0 WTSUB    104 DEFIL   38K MDQ  CMDI
                                                                >    9 <TX> SSISM         383 IBUSY *  100 RETURN   2K NONE*
                                                                >   11 <CH> ACMIS           2 WTMEM     78 GWAKE    1K NONE EDTX JRN
                                                                >    7 <VV> C722           95 IBUSY *   78 KOUTN   26K NONE CMDI
                                                                >    6 <TN> CSC7592         7 IBUSY *  100 RETURN   1K NONE LIST
                                                                >    2 <DT> MASB         1009 NOTSS    100 CGROUT  12K NONE JDAC
                                                                >    3 <CV> PRC105          2 WTMEM     80 KOUTN   11K CARD EDTX
                                                                >    4 <TC> C721           28 IBUSY *  100 KOUTN   11K NONE EDTX
0854:03.303   121735             29*                            :   10 <3X> IRCNTI          1 FMSER *   60 FILACT  38K MDQ  CMDI
0910:12.780   258364            100                                 12 <T3> CSC             2 DRISR     60 JOUT     8K NONE CMDI JOUT
0910:12.781   258366             91                             :      <T3> CSC             2 DRISR+   100 JOUT     8K NONE CMDI JOUT
0918:20.932   301132     2   23,104                             :   10 <3X> IRCNTI          2 DRISR     87 DEFIL   38K MDQ  CMDI
                                                                >   10 <3X> IRCNTI          0 WTSUB    104 DEFIL   38K MDQ  CMDI
                                                                >   11 <CH> ACMIS         139 IBUSY *  100 KOUTN   38K RUNY
```

Figure 15-14. TSS Delay and Users Delay Report

```
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82
                         DISTRIBUTION COLLECTED ON SYSTEM DSCC1  AT 0818:33.201 FRI 82-05-21.  INITIAL GMC TAPE #1469

                  TSS CORE MAP
*********************************************REASON FOR FOLLOWING MAP*****************************************************
0848:44.024* 100696          77                            :  11 9595 CSC           4 WTMEM    78 KOUTN    5K TSEC
--------------------------------------------------------------------------------------------------------------------------

 USR BASE SIZE FREE  LID USER-ID----- TSTAT  TCORE TCPU DIOS LSTDRL PROGRAM-STACK------------ USTOCT STATE TRMIO LAST-TRACE-------
 --- ---- ---- ----  --- ------------ -----  ----- ---- ---- ------ ------------------------ ------ ----- ----- -----------------
HOLE  31K       58K
*********************************************REASON FOR FOLLOWING MAP*****************************************************
0848:44.024* 100698          80                            :  11 9595 CSC           4 WTMEM+   78 KOUTN    5K TSEC
--------------------------------------------------------------------------------------------------------------------------

 USR BASE SIZE FREE  LID USER-ID----- TSTAT  TCORE TCPU DIOS LSTDRL PROGRAM-STACK------------ USTOCT STATE TRMIO LAST-TRACE-------
 --- ---- ---- ----  --- ------------ -----  ----- ---- ---- ------ ------------------------ ------ ----- ----- -----------------
  11  31K   3K  55K 9595 CSC              0   4392    0    0 KOUTN  TSEC                     071610 SWPIN    F   TIME TYPES
*********************************************REASON FOR FOLLOWING MAP*****************************************************
1031:42.147*1047558          77                            :   5 <TN> PRC104       12 WTMEM   100 GWAKE    2K CARD EDTX DJST
--------------------------------------------------------------------------------------------------------------------------

 USR BASE SIZE FREE  LID USER-ID----- TSTAT  TCORE TCPU DIOS LSTDRL PROGRAM-STACK------------ USTOCT STATE TRMIO LAST-TRACE-------
 --- ---- ---- ----  --- ------------ -----  ----- ---- ---- ------ ------------------------ ------ ----- ----- -----------------
HOLE  36K        5K
  25  41K   4K  45K <DI> MASA             0  16759   28    0 FILACT NONE MAS2                064030 SUBDS    F   MAKE S/D ENTRY
*********************************************REASON FOR FOLLOWING MAP*****************************************************
1031:42.148*1047560          80                            :   5 <TN> PRC104       12 WTMEM+   78 GWAKE    2K CARD EDTX DJST
--------------------------------------------------------------------------------------------------------------------------

 USR BASE SIZE FREE  LID USER-ID----- TSTAT  TCORE TCPU DIOS LSTDRL PROGRAM-STACK------------ USTOCT STATE TRMIO LAST-TRACE-------
 --- ---- ---- ----  --- ------------ -----  ----- ---- ---- ------ ------------------------ ------ ----- ----- -----------------
   5  36K   2K   3K <TN> PRC104           0  17219    0    0 GWAKE  CARD EDTX DJST           070010 SWPIN    F   TIME TYPES
  25  41K   4K  45K <DI> MASA             2  16760   28    0 FILACT NONE MAS2                064030 SUBDS    F   MAKE S/D ENTRY
*********************************************REASON FOR FOLLOWING MAP*****************************************************
1031:42.152*1047564          80                            :  12 <TM> WSSIB        10 WTMEM+   78 GWAKE    2K DJST
--------------------------------------------------------------------------------------------------------------------------

 USR BASE SIZE FREE  LID USER-ID----- TSTAT  TCORE TCPU DIOS LSTDRL PROGRAM-STACK------------ USTOCT STATE TRMIO LAST-TRACE-------
 --- ---- ---- ----  --- ------------ -----  ----- ---- ---- ------ ------------------------ ------ ----- ----- -----------------
   5  36K   2K   0K <TN> PRC104           3  17222    0    0 GWAKE  CARD EDTX DJST           070010 SWPIN    F   TIME TYPES
  12  38K   2K   1K <TM> WSSIB            0  14541   12   20 GWAKE  DJST                     077570 SWPIN    F   TIME TYPES
  25  41K   4K  45K <DI> MASA             5  16763   28    0 FILACT NONE MAS2                064030 SUBDS    F   MAKE S/D ENTRY
*********************************************REASON FOR FOLLOWING MAP*****************************************************
1031:46.303*1047827          77                            :   1 <TS> PRC105        4 WTMEM    77 KOUTN   11K CARD EDTX
--------------------------------------------------------------------------------------------------------------------------

 USR BASE SIZE FREE  LID USER-ID----- TSTAT  TCORE TCPU DIOS LSTDRL PROGRAM-STACK------------ USTOCT STATE TRMIO LAST-TRACE-------
 --- ---- ---- ----  --- ------------ -----  ----- ---- ---- ------ ------------------------ ------ ----- ----- -----------------
HOLE  36K        2K
  12  38K   2K   0K <TM> WSSIB            1    928    1    2 DIO    DJST                     077570 SUBDS    F   MAKE S/D ENTRY
  18  40K   2K   0K <TK> USERID UNKWN     2    646    0    0 CGROUT NEW                      073440 SUBDS    F   MAKE S/D ENTRY
  25  42K   2K   4K <DI> MASA             0    144    0    0 RETURN NONE CMDI                064030 SUBDS    F   MAKE S/D ENTRY
```

Figure 15-15. TSS Core Map

TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

DISTRIBUTION COLLECTED ON SYSTEM DSCC1 AT 0818:33.201 FRI 82-05-21. INITIAL GMC TAPE #1469

ERROR MESSAGE REPORT

TOD & RECNO		ERROR MESSAGE
0850:19.630	108727	LINE <TK>, USERID C433 :: LAST KNOWN - WAIT NORM. JUST REPORTED - OUT OF MEM.
0920:36.929	3148308	LINE 7412, USERID DJ8XC344AM :: LAST KNOWN - WAIT FORCD. JUST REPORTED - OUT OF MEM.

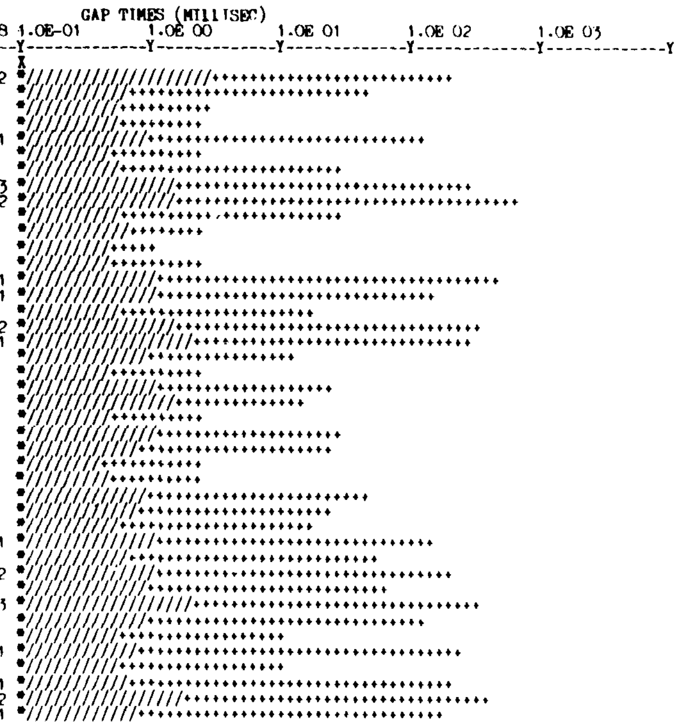
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

DISTRIBUTION COLLECTED ON SYSTEM DSCC1 AT 0818:33.201 FRI 82-05-21. INITIAL GMC TAPE #1469

INTERTRACE GAP (DURATION) - ADJUSTED FOR TSS GEWAKES PLOT- 7

-= MIN /= AVG += MAX

USERS	TIME	DURATION IN INTERVAL (MS) <4	<8	<16	<32	<64	<128	>128
0	0818:54.01	DATA NOT COLLECTED IN THE INTERVAL.						
4	0819:14.01	365	0	2	1	5	2	2
4	0819:34.01	607	0	0	1	2		
4	0819:54.01	486						
4	0820:14.01	151						
4	0820:34.01	261	0	0	0	0	0	1
4	0820:54.01	93						
4	0821:14.01	455	0	0	2			
4	0821:34.01	674	4	4	0	0	0	3
4	0821:54.01	758	0	0	0	0	0	2
4	0822:14.01	1451	3	2	1			
4	0822:34.01	175						
4	0822:54.01	16						
4	0823:14.01	380						
5	0823:34.01	1155	8	7	2	0	2	1
5	0823:54.01	581	0	5	2	0	1	1
6	0824:14.01	446	2	2	1			
6	0824:34.01	864	18	23	1	0	1	2
6	0824:54.01	374	2	9	0	0	2	1
6	0825:14.01	889	19	24				
6	0825:34.01	513						
6	0825:54.01	588	17	25	2			
6	0826:14.01	1631	73	137	2			
6	0826:34.01	276						
7	0826:54.01	3145	101	150	4			
7	0827:14.01	1126	20	26	2			
7	0827:34.01	184						
7	0827:54.01	117						
7	0828:14.01	311	5	7	0	1		
7	0828:34.01	409	3	6	1			
8	0828:54.01	806	3	1	1			
8	0829:14.01	323	0	2	0	1	0	1
8	0829:34.01	913	1	8	1	1		
8	0829:54.01	1220	0	2	2	1	2	2
8	0830:14.01	666	4	4	4	0	1	
8	0830:34.01	867	21	23	2	0	2	3
8	0830:54.01	860	1	1	0	1	3	
8	0831:14.01	1478	2	3				
8	0831:34.01	1236	4	1	0	2	0	1
8	0831:54.01	368	1	2				
8	0832:14.01	1250	0	0	0	0	0	1
8	0832:34.01	882	24	25	0	1	1	2
8	0832:54.01	705	0	0	0	0	0	1



CURVE	MINIMUM	MAXIMUM
MIN	0.	0.
AVG	4.3866E-01	1.0582E 01
MAX	1.0940E 00	1.2234E 04

Figure 15-17. Intertrace Gap Duration Plot

TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

DISTRIBUTION COLLECTED ON SYSTEM DSCC1 AT 0818:33.201 FRI 82-05-21. INITIAL GMC TAPE #1469

MEMORY ACTIVITY (TRACES 63, 65-75)

REPORT- 1

TOD	TRACE 63	TRACE 65	TRACE 66	TRACE 67	TRACE 68	TRACE 69	TRACE 70	TRACE 71	TRACE 72	TRACE 73	TRACE 74	TRACE 75
0818:54.012												
0819:14.012												
0819:34.012												
0819:54.012												
0820:14.012												
0820:34.012												
0820:54.012												
0821:14.012												
0821:34.012												
0821:54.012												
0822:14.012												
0822:34.012												
0822:54.012												
0823:14.012												
0823:34.012	-	-	-	-	-	-	-	1				
0823:54.012												
0824:14.012												
0824:34.012												
0824:54.012												
0825:14.012												
0825:34.012												
0825:54.012	1	-	-	-	-	1	-	1				
0826:14.012	1											
0826:34.012												
0826:54.012												
0827:14.012												
0827:34.012												
0827:54.012												
0828:14.012												
0828:34.012												
0828:54.012												
0829:14.012												
0829:34.012												
0829:54.012												
0830:14.012	1											
0830:34.012												
0830:54.012												
0831:14.012												
0831:34.012												
0831:54.012												
0832:14.012												
0832:34.012												
0832:54.012												

63=ENTER SWAP DECIS

65=CONSIDER TSS INCR
66=INITIATE SIZE INCR
67=SET UP FENCE
68=MEMORY RESERVE
69=FORCE SWAP
70=TERMINATE SWAP
71=TSS1 UST AREA +1K
72=GEMORE MEMORY
73=GEMORE SUCCESSFUL
74=MEMORY RELEASE
75=GEMORE REFUSED

Figure 15-18. Memory Activity Report

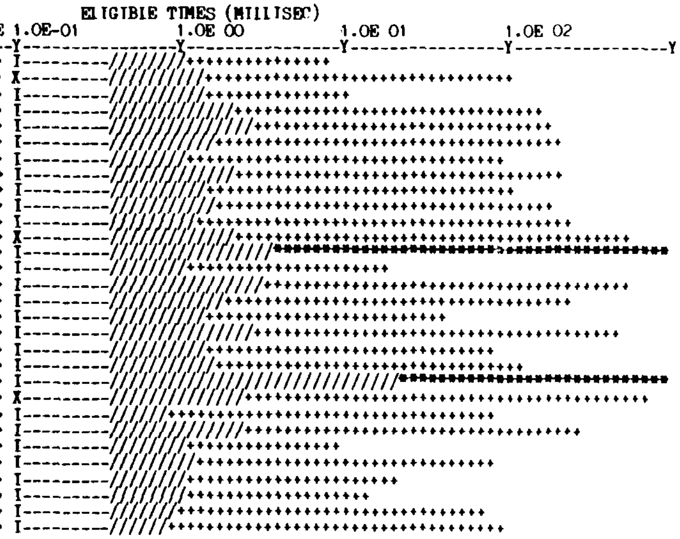
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

DISTRIBUTION COLLECTED ON SYSTEM DSCC1 AT 0818:33.201 FRI 82-05-21. INITIAL GMC TAPE #1469

ELIGIBIES FOR SUBDISPATCH (DURATION) PLOT- 8

-= MIN /= AVG .+= MAX

USERS	TIME	DURATION IN INTERVAL (MS) <1	<2	<4	<8	<16	<32	>32	LINE
23	1025:14.01	260	5	109	5				<TS>
23	1025:34.01	407	12	90	28	4	2	1	<TP>
23	1025:54.01	319	9	66	26	6			<TN>
22	1026:14.01	508	13	157	42	0	0	5	<TO>
23	1026:34.01	402	10	108	32	9	2	7	<DB>
23	1026:54.01	563	12	150	23	3	1	4	<CH>
24	1027:14.01	482	9	115	12	2	0	1	<DB>
24	1027:34.01	613	10	124	36	7	0	8	<DJ>
24	1027:54.01	482	14	140	30	5	0	1	<DJ>
23	1028:14.01	428	18	109	17	7	0	2	<TO>
23	1028:34.01	640	27	144	23	1	0	1	<TM>
23	1028:54.01	353	11	113	6	3	0	1	<CH>
24	1029:14.01	395	12	135	28	10	0	1	<DB>
25	1029:34.01	493	9	142	14	3	1		<TS>
24	1029:54.01	604	18	191	56	16	3	4	<TN>
23	1030:14.01	511	16	192	39	5	0	2	<TS>
23	1030:34.01	543	14	182	43	10	3	1	<TM>
21	1030:54.01	549	15	148	41	15	2	3	<TM>
21	1031:14.01	347	8	122	8	1	1	2	<TS>
21	1031:34.01	392	5	157	26	7	1	1	<TS>
22	1031:54.01	236	4	45	12	11	3	6	<TN>
22	1032:14.01	392	5	158	16	4	0	2	<TC>
22	1032:34.01	1939	19	184	60	12	0	2	<TX>
22	1032:54.01	681	26	204	81	18	2	6	<TN>
22	1033:14.01	444	5	133	18	4			<DJ>
22	1033:34.01	488	6	166	17	2	0	1	<CH>
22	1033:54.01	375	4	140	10	0	1		<CH>
22	1034:14.01	457	15	123	16	2			<TK>
22	1034:34.01	1117	22	142	39	6	0	1	<TM>
21	1034:48.96	1093	7	119	17	2	0	1	<TC>



CURVE	MINIMUM	MAXIMUM
MIN	7.2000E-02	4.1700E-01
AVG	5.5007E-01	4.8654E 01
MAX	2.1680E 00	7.9746E 03

Figure 15-19. Eligibles For Subdispatch Plot

```
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82
                     DISTRIBUTION COLLECTED ON SYSTEM DSCC1  AT 0818:33.201 FRI 82-05-21.  INITIAL GMC TAPE #1469


                                              IN SUBDISPATCH (DURATION)                                    PLOT- 9
                                                  -= MIN    /= AVG    += MAX

                         DURATION IN INTERVAL (MS)                 SUBDISPATCH TIMES (MILLISEC)
USERS   TIME           <1   <2   <4   <8  <16  <32  >32  LINE 1.0E 00          1.0E 01          1.0E 02          1.0E 03
-----------------------------------------------------------Y----------------Y----------------Y----------------Y----------------Y
  0  0818:54.01    DATA NOT COLLECTED IN THIS INTERVAL.          X
  4  0819:14.01      0    1   18    6                   <TN> I---///////+++
  4  0819:34.01      0    0   55    8                   <TN> I---------/+
  4  0819:54.01      0    0   36   14                   <TN> I---------/++++
  4  0820:14.01      0    0   19    1                   <CV> I---------/++++
  4  0820:34.01      0    0   13    8                   <TN> I---------/++
  4  0820:54.01      0    0    2    4                   <TN> I----------/+++
  4  0821:14.01      0    1   27   11                   <TN> I----//////++
  4  0821:34.01      0    0   35   24    0    7    3    <TN> I--------/////////++++++++++++++++++++++++
  4  0821:54.01      0    1   41   27    2              <TN> I----////////+++++++
  4  0822:14.01      0    0   81   50                   <TN> X-----//////+++
  4  0822:34.01      0    1   11   12                   <CV> I---///////+
  4  0822:54.01                                              I
  4  0823:14.01      0    1   11   14    6              <TN> I----////////+++++
  5  0823:34.01      0    1   46   28   23    9    1    <TC> I----//////////+++++++++++
  5  0823:54.01      0    2   36   13                   <TC> I---////////+++
  6  0824:14.01      0    0   29   10                   <TK> I---------/+
  6  0824:34.01      0    2   31   30   11   40    2    <TK> I---////////////////+++++++++
  6  0824:54.01      0    2   12   12    5    7         <TC> I---//////////////++++++++
  6  0825:14.01      0    1   36   34    3   42    1    <TK> I----///////////////++++++++++
  6  0825:34.01      0    3   42   17    1              <TA> X---////////+++++
  6  0825:54.01      0    1   16   18    3   43         <TK> I---/////////////////+++++
  6  0826:14.01      0    0    6   17   28  219    2    <TN> I-------///////////////+++++
  6  0826:34.01      0    1   20   11                   <TA> I---////////+++
  7  0826:54.01      0    5  100   60   39  255    6    <TK> I---/////////////////////+++++++
  7  0827:14.01      0    1   58   23    4   43         <TK> I---/////////////////+++++++
  7  0827:34.01      0    0    9    5                   <TA> I---------/++
  7  0827:54.04      0    2    3    3                   <TK> I---/////+++
  7  0828:14.01      0    1   13    6    3    9         <TK> I---////////////////++++++
  7  0828:34.01      0    1   20   15    1   10         <TK> I----//////////////++++++++
  8  0828:54.01      0    2   55   29    1              <TA> X----////////+++++
  8  0829:14.01      0    3   14    5    2              <TK> I---/////////++++++++
  8  0829:34.01      0    0   48   48    7    6         <TN> I---------///++++++++++


   CURVE        MINIMUM         MAXIMUM
   MIN        5.9000E-02      4.0850E 00
   AVG        3.2497E 00      1.0896E 02
   MAX        4.1540E 00      9.2997E 03
```

Figure 15-20. In Subdispatch Plot

```
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82
                    DISTRIBUTION COLLECTED ON SYSTEM DSCC1  AT 0818:33.201 FRI 82-05-21.  INITIAL GMC TAPE #1469

                                       ELIGIBLE FOR AND IN SUBDISPATCH (DURATION)                                  PLOT-10

                                                     -= MIN    /= AVG    += MAX

                  DURATION IN INTERVAL (MS)                       SUM TIMES (MILLISEC)
USERS   TIME       <1   <2   <4   <8  <16  <32  >32  LINE 1.0E-01        1.0E 00        1.0E 01        1.0E 02        1.0E 03
--------------------------------------------------------Y--------------Y--------------Y--------------Y--------------Y--------------Y
  0  0818:54.01  DATA NOT COLLECTED IN THIS INTERVAL.    X
  4  0819:14.01  [illegible]    1    2   22    1             <TN> I--------/////////////++++++++
  4  0819:34.01    63    0    0   62    1             <TN> I--------////////////+++++++
  4  0819:54.01    48    2    0   50                  <CV> I--------/////////////++++++
  4  0820:14.01    20    0    1   18    1             <CV> I--------/////////////+++++++++
  4  0820:34.01    22    0    0   21                  <TN> I--------/////////////+++++
  4  0820:54.01     5    1    0    6                  <TN> I--------/////////////++++++
  4  0821:14.01    40    0    0   39                  <TN> I--------/////////////++++++
  4  0821:34.01    67    1    0   57    2    7    3   <TN> I--------/////////////////++++++++++++++++++++++
  4  0821:54.01    71    1    1   64    6             <TN> I--------/////////////++++++++++
  4  0822:14.01   133    1    2  124    6             <TN> X--------//////////////++++++
  4  0822:34.01    24    0    1   23                  <CV> I--------/////////////+++++++
  4  0822:54.01                                       I
  4  0823:14.01    32    0    0   26    6             <TN> I--------//////////////+++++++
  5  0823:34.01   113    1    1   71   26    9    1   <TC> I--------///////////////+++++++++++++
  5  0823:54.01    52    1    2   47    2             <TC> I--------/////////////+++++++
  6  0824:14.01    46    0    0   39                  <TK> I--------////////////++++++
  6  0824:34.01    75    0    4   57   13   41    2   <TK> I--------/////////////////+++++++++++
  6  0824:54.01    32    0    1   23    6    8        <TC> I--------////////////////+++++++++
  6  0825:14.01    75    1    1   69    4   42    1   <TK> I--------/////////////////++++++++++
  6  0825:34.01    63    0    2   60    1             <TA> X--------///////////++++++++
  6  0825:54.01    40    1    2   31    4   44        <TK> I--------///////////////////++++++
  6  0826:14.01    52    0    0   23   26  221    2   <TN> I--------///////////////////////++++++
  6  0826:34.01    32    0    1   31                  <TA> I--------////////////++++++
  7  0826:54.01   221    2   19  134   51  256    6   <TN> I--------///////////////////+++++++++
  7  0827:14.01    87    2    4   78    3   44        <TK> I--------////////////////+++++++++
  7  0827:34.01    14    0    0   14                  <TA> I--------///////////+++++
  7  0827:54.01     8    0    2    6                  <TK> I--------///////////++++++
  7  0828:14.01    22    0    1   19    3    9        <TK> I--------///////////////++++++++
  7  0828:34.01    40    1    2   33    2   10        <TK> I--------//////////////++++++++++
  8  0828:54.01    97    0    2   86    2             <TA> X--------////////////++++++++
  8  0829:14.01    28    1    2   19    3             <TK> I--------/////////////++++++++++
  8  0829:34.01   108    0    0   85   18    6        <TN> I--------/////////////+++++++++++

   CURVE       MINIMUM        MAXIMUM
   MIN       7.2000E-02     4.1700E-01
   AVG       2.3760E 00     5.9207E 01
   MAX       6.0190E 00     9.3007E 03
```

Figure 15-21. Eligibles For and In Subdispatch Plot

```
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82
                    DISTRIBUTION COLLECTED ON SYSTEM DSCC1  AT 0818:33.201 FRI 82-05-21.  INITIAL GMC TAPE #1469

                                             USER SWAPS (SWAP RATE)                                  PLOT-11
                                                   -* RATE

                                                         K SWAPPED / SEC
                                   USERS  TIME     1.0E 00             1.0E 01              1.0E 02
------------------------------------------------------Y--------------------Y--------------------Y--------------------Y
DATA NOT COLLECTED IN THIS INTERVAL.   0  0818:54.01 X
                                       4  0819:14.01 *
                                       4  0819:34.01 I----------
                                       4  0819:54.01 I----------
                                       4  0820:14.01 I
                                       4  0820:34.01 I-------------
                                       4  0820:54.01 -
                                       4  0821:14.01 I---------------
                                       4  0821:34.01 -
                                       4  0821:54.01 I-------------
                                       4  0822:14.01 X------
                                       4  0822:34.01 I
                                       4  0822:54.01 I
                                       4  0823:14.01 I----------
                                       5  0823:34.01 I----------------
                                       5  0823:54.01 I------
                                       6  0824:14.01 I------
                                       6  0824:34.01 I------
                                       6  0824:54.01 *
                                       6  0825:14.01 -
                                       6  0825:34.01 -
                                       6  0825:54.01 *
                                       6  0826:14.01 -
                                       6  0826:34.01 *
                                       7  0826:54.01 I------------------
                                       7  0827:14.01 I-----------------------
                                       7  0827:34.01 *
                                       7  0827:54.01 *
                                       7  0828:14.01 -
                                       7  0828:34.01 *
                                       8  0828:54.01 X------
                                       8  0829:14.01 -
                                       8  0829:34.01 I------

   CURVE     MINIMUM       MAXIMUM
   RATE      0.            7.3000E 01
```

Figure 15-22. User Swap Rate Plot

```
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82
                    DISTRIBUTION COLLECTED ON SYSTEM DSCC4  AT 0818:33.201 FRI 82-05-21.  INITIAL GMC TAPE #1469


                                        USER SWAPS (SWAP AMOUNT)                                    PLOT-12
                                            -= AVG    /= TOT

                     CORE IN INTERVAL (K)                    SWAP SIZE (K)
USERS   TIME        <2   <4   <8  <16  <32  <64  >64  LINE 1.0E 00         1.0E 01         1.0E 02         1.0E 03
-------------------------------------------------------------Y---------------Y---------------Y---------------Y---------------Y
  0  0818:54.01  DATA NOT COLLECTED IN THIS INTERVAL.         X
  4  0819:14.01      3    1    2                        <TN> I------////////////
  4  0819:34.01      2    0    3    4                   <TN> I------------///////////////
  4  0819:54.01      2    0    2    4                   <TN> I------------//////////////
  4  0820:14.01                                              I
  4  0820:34.01      0    0    0    6                   <TN> I---------------///////////
  4  0820:54.01      0    0    0    2                   <TN> I---------------////
  4  0821:14.01      1    0    1    8                   <TN> I--------------///////////////
  4  0821:34.01      4    1    2    1                   <TN> I-------//////////////
  4  0821:54.01      3    1    3    4                   <TN> I------------///////////////
  4  0822:14.01      3   10    0    2                   <TN> X-------//////////////////
  4  0822:34.01                                              I
  4  0822:54.01                                              I
  4  0823:14.01      1    0    0    6                   <TN> I-------------/////////////
  5  0823:34.01      2   10    3    7                   <TN> I----------///////////////////
  5  0823:54.01      2    1    7                        <TC> I---------///////////////
  6  0824:14.01      1    5    4                        <TA> I-------///////////////
  6  0824:34.01      1    0    4    1                   <TK> I------------///////////
  6  0824:54.01      1    0    0    1                   <TC> I------------////
  6  0825:14.01      0    1    1    2                   <TC> I-------------/////////
  6  0825:34.01      1    0    4                        <TA> X---------//////////
  6  0825:54.01      0    1    0    1                   <TN> I----------/////
  6  0826:14.01      1    0    0    3                   <TN> I------------/////////
  6  0826:34.01      1    0    2                        <TA> I--------///////
  7  0826:54.01      2   10    2    5    2              <VV> I------------///////////////////
  7  0827:14.01      3    3    0    1    7              <VV> I-----------------//////////////////
  7  0827:34.01      0    0    2                        <TA> I----------/////
  7  0827:54.01      1                                  <TK> 2
  7  0828:14.01      1    0    1    1                   <TK> I------------///////
  7  0828:34.01      0    1    1                        <TA> I--------/////
  8  0828:54.01      2    5    4                        <TA> X-------////////////////
  8  0829:14.01      1    1    1    1                   <VV> I----------/////////
  8  0829:34.01      2    0    3    3                   <VV> I-----------//////////////


   CURVE      MINIMUM       MAXIMUM
   AVG        1.0000E 00    2.0667E 01
   TOT        1.0000E 00    1.1770E 03
```

Figure 15-23. User Swap Amount Plot

TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

DISTRIBUTION COLLECTED ON SYSTEM DSCC1 AT 0818:33.201 FRI 82-05-21. INITIAL GMC TAPE #1469

```
                                         USER SWAPS (DURATION)                                    PLOT-13

                                            -= MIN    /= AVG    += MAX

                    DURATION IN INTERVAL (HS)               SWAP TIMES (HUNDREDTHS SEC)
USERS  TIME        <1  <2  <4  <8  <16 <32 >32  LINE 1.0E-01          1.0E 00          1.0E 01          1.0E 02
-------------------------------------------------------Y----------------Y----------------Y----------------Y----------------Y
  0  0818:54.01  DATA NOT COLLECTED IN THIS INTERVAL.        X
  4  0819:14.01     0   0   3                        <CV> I-----------------------2
  4  0819:34.01     0   0   2   3   4                <TN> I-----------------------//////+++++
  4  0819:54.01     0   0   1   1   4                <TN> I------------------------//////++++
  4  0820:14.01                                           I
  4  0820:34.01     0   0   0   0   6                <TN> I-------------------------------2
  4  0820:54.01     0   0   0   0   2                <TN> I333333333333333333333333333333333
  4  0821:14.01     0   0   1   1   8                <TN> I---------------------//////////+
  4  0821:34.01     0   0   4   1   1                <TN> I------------------------///+++++
  4  0821:54.01     0   0   4   1   3   0   1        <TN> I------------------------//////////+++++++++++
  4  0822:14.01     0   1   6   2   2                <TN> X--------------------//////+++++++
  4  0822:34.01                                           I
  4  0822:54.01                                           I
  4  0823:14.01     0   0   0   5   1                <TN> I----------------------------///++++
  5  0823:34.01     0   1   7   9   1                <TA> I--------------------/////////+++++
  5  0823:54.01     0   0   2   7                    <TA> I------------------------////+
  6  0824:14.01     0   0   3   4                    <TA> I----------------------////++
  6  0824:34.01     0   0   0   4   1                <TK> I---------------------------//++
  6  0824:54.01     0   0   0   0   1                <TC> I333333333333333333333333333333333
  6  0825:14.01     0   0   1   1   2                <TC> I----------------------/////////+++++
  6  0825:34.01     0   0   0   4                    <TA> X2222222222222222222222222222+
  6  0825:54.01     0   0   2                        <TN> I-----------------------/+
  6  0826:14.01     0   0   0   2   2                <TN> I------------------------------/+
  6  0826:34.01     0   0   0   2                    <TA> I2222222222222222222222222222+
  7  0826:54.01     0   0   6   8   2   1            <VV> I---------------------/////////+++++++++
  7  0827:14.01     0   0   3   2   1   7            <VV> I----------------------/////////////+++
  7  0827:34.01     0   0   0   2                    <TA> I22222222222222222222222222222+
  7  0827:54.01                                           I
  7  0828:14.01     1   0   0   0   1                <TK> I-----------------//////////////+++++
  7  0828:34.01     0   0   1   2                    <TA> I----------------------/////++
  8  0828:54.01     0   0   1   6                    <TA> X-----------------------////+
  8  0829:14.01     0   1   0   1   1                <VV> I---------------------////////++++
  8  0829:34.01     0   0   1   4   3                <VV> I------------------------//////+++

   CURVE        MINIMUM       MAXIMUM
   MIN        7.5500E-02    9.4358E 00
   AVG        3.0151E 00    4.4564E 01
   MAX        3.4088E 00    3.2226E 02
```

Figure 15-24. User Swap Duration Plot

```
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82
                         DISTRIBUTION COLLECTED ON SYSTEM DSCC1  AT 0818:33.201 FRI 82-05-21.  INITIAL GMC TAPE #1469


                                                      USER I/OS (DURATION)                                PLOT-14

                                                        -= MIN   /= AVG   += MAX

                            DURATION IN INTERVAL (HS)                    I/O TIMES (HUNDREDTHS SEC)
USERS  TIME           <1   <2   <4   <8  <16  <32  >32  LINE 1.0E-01          1.0E 00          1.0E 01          1.0E 02
---------------------------------------------------------------Y----------------Y----------------Y----------------Y----------------Y
  0  0818:54.01   DATA NOT COLLECTED IN THIS INTERVAL.          X
  4  0819:14.01    1    3    4    3                      <CV> I---------------//////////++++++
  4  0819:34.01    0    3    2    4                      <CV> I---------------------/////++++
  4  0819:54.01    0    2    2    2                      <CV> I---------------------/////+++++
  4  0820:14.01    0    3                                <CV> I33333333333333333333
  4  0820:34.01    0    1                                <TN> I333333333333333333
  4  0820:54.01                                               I
  4  0821:14.01    0    2    2    2                      <TN> I------------------////////++++++
  4  0821:34.01    0    3   12    4                      <TC> I------------------////////+++++
  4  0821:54.01    1    5   10    4                      <TC> I-----------------/////////++++++
  4  0822:14.01   34    5   21   41                      <TN> X-------------///////////++++++
  4  0822:34.01    0    2    0    1                      <CV> I------------------///////+++++
  4  0822:54.01                                               I
  4  0823:14.01    0    0    4    6    3                 <TN> I----------------------///////+++++
  5  0823:34.01    1    2    3   28    4                 <TN> I--------------///////////////(++++++
  5  0823:54.01    1    3    2    5    1                 <TC> I---------------///////////++++++
  6  0824:14.01    3    0    0    2    1                 <TK> I-----------------/////////++++++
  6  0824:34.01    2    4   12    5                      <TK> I-----------------////////+++++++
  6  0824:54.01    0    5    6    3                      <TC> I-------------------//////+++++
  6  0825:14.01    1    6    6    4    1                 <TK> I----------------//////////+++++++
  6  0825:34.01    1    2    1    1    1                 <TK> X----------------//////////++++++
  6  0825:54.01    1    5    5    1    1                 <TK> I-----------------/////////++++++++
  6  0826:14.01    0    0    0   26    4                 <TN> I------------------------------//++++
  6  0826:34.01    0    1    1    1                      <TK> I-------------------///////++++
  7  0826:54.01    4    9    6   30    6    1            <VV> I--------------/////////////////+++++++++
  7  0827:14.01    2    6    6    4    2                 <TK> I---------------//////////+++++++
  7  0827:34.01    0    0    2                           <TA> I333333333333333333333333333
  7  0827:54.01    0    0    0    1                      <TK> I33333333333333333333333333333333
  7  0828:14.01    0    2    3    1                      <TK> I-------------------////+++++
  7  0828:34.01    1    3    2    1    2                 <TK> I---------------///////////++++++
  8  0828:54.01    1    2    2    2    1                 <TK> X--------------////////////++++++
  8  0829:14.01    1    3    1    2    1                 <VV> I---------------//////////+++++++
  8  0829:34.01    0    3    2    2                      <CV> I-------------------///////+++++


    CURVE        MINIMUM        MAXIMUM
    MIN        1.6000E-02      6.5128E 00
    AVG        1.0655E 00      2.3179E 01
    MAX        1.3016E 00      2.0628E 02
```

Figure 15-25. User I/OS Duration Plot

```
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER ｆ.
          DISTRIBUTION COLLECTED ON SYSTEM DSCC1   AT 0818:33.201 FRI 82-05-21.  INITIAL GMC TAPE #1469


                                     IN SMC WAIT (DURATION)                                            PLOT-15

                                          -= MIN    /= AVG    += MAX

                       WAITS IN INTERVAL (HS)                      WAIT TIMES (HUNDREDTHS SEC)
USERS  TIME       <1   <2   <4   <8  <16  <32  >32  LINE 1.0E 00       1.0E 01       1.0E 02       1.0E 03       1.0E 04
---------------------------------------------------------Y-------------Y-------------Y-------------Y-------------Y-------------Y
 19  1016:34.01                                          I
 19  1016:54.01    1    0    0    0    0    1       <CW> *///////////////++++
 19  1017:14.01                                          I
 19  1017:34.01                                          I
 19  1017:54.01                                          I
 21  1018:14.01                                          I
 21  1018:34.01                                          I
 21  1018:54.01                                          X
 19  1019:14.01                                          I
 19  1019:34.01                                          I
 20  1019:54.01                                          I
 20  1020:14.01                                          I
 19  1020:34.01                                          I
 19  1020:54.01    0    0    0    0    0    0    1  <CW> I333333333333333333333333
 19  1021:14.01    1    0    0    0    0    0    1  <CW> *////////////////+++++
 19  1021:34.01                                          I
 18  1021:54.01    1                                <CW> *
 19  1022:14.01    0    0    0    0    0    0    1  <CW> X3333333333333333333333333333333
 19  1022:34.01    0    0    0    0    0    1       <TX> I3333333333333333333
 21  1022:54.01                                          I
 21  1023:14.01                                          I
 24  1023:34.01                                          I
 22  1023:54.01                                          I
 22  1024:14.01                                          I
 22  1024:34.01    0    0    0    0    0    0    1  <CW> I33333333333333333333333
 22  1024:54.01                                          I
 23  1025:14.01                                          I
 23  1025:34.01                                          X
 23  1025:54.01                                          I
 22  1026:14.01                                          I
 23  1026:34.01    3    0    0    0    1    3       <CH> *///////////////++++
 23  1026:54.01                                          I
 24  1027:14.01                                          I


    CURVE      MINIMUM        MAXIMUM
    MIN        2.9210E-01     1.4286E 02
    AVG        2.9440E-01     1.4286E 02
    MAX        2.9440E-01     1.4286E 02
```

Figure 15-26. In System Master Catalog (SMC) Wait Plot

TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

DISTRIBUTION COLLECTED ON SYSTEM DSCC1 AT 0818:33.201 FRI 82-05-21. INITIAL GMC TAPE #1469

INTERTRACE TIME (ADJUSTED FOR TSS GEWAKES)

INDIV. NUMBER	CUMUL. NUMBER	CUMUL. PRC	INDIV. PRC	MILLI-SEC	PERCENT OF OCCURRENCE 00 10 20 30 40 50 60 70 80 90 100	HISTOGRAM 5
972506	972506	99.881	99.881	0- 63	IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	
441	972947	99.92	0.045	64- 127	I	
257	973204	99.953	0.026	128- 191	I	
169	973373	99.970	0.017	192- 255	I	
99	973472	99.980	0.010	256- 319	I	
59	973531	99.986	0.006	320- 383	I	
37	973568	99.990	0.004	384- 447	I	
23	973591	99.993	0.002	448- 511	I	
19	973610	99.994	0.002	512- 575	I	
13	973623	99.996	0.001	576- 639	I	
8	973631	99.997	0.001	640- 703	I	
2	973633	99.997	0.000	704- 767	I	
1	973634	99.997	0.000	768- 831	I	
4	973638	99.997	0.000	832- 895	I	
2	973640	99.998	0.000	896- 959	I	
3	973643	99.998	0.000	960-1023	I	
3	973646	99.998	0.000	1024-1087	I	
1	973647	99.998	0.000	1088-1151	I	
1	973648	99.998	0.000	1152-1215	I	
0	973648	99.998	0.	1216-1279	I	
1	973649	99.998	0.000	1280-1343	I	
1	973650	99.999	0.000	1344-1407	I	
2	973652	99.999	0.000	1408-1471	I	
0	973652	99.999	0.	1472-1535	I	
0	973652	99.999	0.	1536-1599	I	
2	973654	99.999	0.000	1600-1663	I	
0	973654	99.999	0.	1664-1727	I	
0	973654	99.999	0.	1728-1791	I	
0	973654	99.999	0.	1792-1855	I	
0	973654	99.999	0.	1856-1919	I	
0	973654	99.999	0.	1920-1983	I	
1	973655	99.999	0.000	1984-2047	I	
0	973655	99.999	0.	2048-2111	I	
0	973655	99.999	0.	2112-2175	I	
2	973657	99.999	0.000	2176-2239	I	
1	973658	99.999	0.000	2240-2303	I	
1	973659	99.999	0.000	2304-2367	I	
0	973659	99.999	0.	2368-2431	I	
0	973659	99.999	0.	2432-2495	I	
0	973659	99.999	0.	2496-2559	I	
0	973659	99.999	0.	2560-2623	I	
0	973659	99.999	0.	2624-2687	I	
0	973659	99.999	0.	2688-2751	I	
0	973659	99.999	0.	2752-2815	I	
0	973659	99.999	0.	2816-2879	I	
0	973659	99.999	0.	2880-2943	I	
0	973659	99.999	0.	2944-3007	I	
0	973659	99.999	0.	3008-3071	I	
0	973659	99.999	0.	3072-3135	I	
1	973660	100.000	0.000	3136-3199	I	

973664 ENTRIES TOTAL AVERAGE = 0.82838 VARIANCE = 484.012 STANDARD DEVIATION = 22.000
4(0%) OUT OF RANGE AVERAGE FOR THESE = 9069.50 IN RANGE AVERAGE = 0.79

Figure 15-27. Intertrace Time (Adjusted For GEWAKES)Histogram

The reports that the Formatted Dump pass produces are:

- o Formatted Dump (figure 15-28) (no ID #)
- o Intertrace Time (Histogram) (figure 15-29) (ID #9).

15.5.1 TEARS Response Pass Reports

15.5.1.1 TSS Reduction Event Log. The report is a chronological listing produced as the tape is processed (figure 15-2). It indicates control changes of the Response routine, actions of the TSS Executive, and major events for individual users. For developmental use, the report also shows reduction anomalies; they are not of concern to the user. The report gives an overview of the physical makeup of the data collection period.

Each event record is formatted on one line with a time-stamp at the leftmost margin. Next to the time-stamp, for events which are related to the processing of a GMF trace type 74, the number of the trace (counting from the start of the tape) is recorded. These values can be used to locate an event on other reports or formulate timeframes for subsequent reductions. The third field is the Trace 74 subtype number. The fourth is the two-character line ID of the terminal or the four-character DRUN ID (without the suffix letter "D"). (At logon, DRUN identification is not available; the field is left blank). The next field is the name of the subsystem in control of the user at the time of the event. Following this information is a textual explanation of the event.

Examples of items on the report are:

Response control messages:
- Start of reduction tape
- Start of timeframe
- End of timeframe
- End of reduction tape.

TSS executive actions:
- Grow/reduce TSS core size
- Grow/reduce UST area
- Monitor TRACE ON/OFF.

Major user events:
- Logon/logoff
- Abnormal disconnect
- Connect command
- JDAC command.

Reduction anomalies (for developmental use):
- Program stack synchronization problems
- I/O conflicts.

```
TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

                    DISTRIBUTION COLLECTED ON SYSTEM DSCC1  AT 0818:43.515 FRI 82-05-21.  INITIAL GMC TAPE #1469

TOD           REC-CNT     MNEMONIC   &       #  UST# LINE  LITERAL             USERID           NOTES
------------  -------  ------------------  ---- ---- ----  --------------------.....-----------  -------- ---------------------
0818:54.014   LINE <TC> IS "C721       "   --  LOGON AT 0809:30.861
              LINE <CV> IS "PRC105     "   --  LOGON AT 0814:02.739
              LINE <DI> IS "MASB       "   --  LOGON AT 0814:41.176
              LINE <TN> IS "PRC104     "   --  LOGON AT 0816:22.622
0818:54.014          6  PROCESS .CRTSQ     89
0818:54.015          7  ENTER PROC ALLOC   61
0818:54.015          8  ENTER MEMORY ALL   62
0818:54.015          9  ENTER PROC ALLOC   61
0818:54.016         10  GEWAKE S/D BUSY    18             CPS        640000
0818:55.586         11  ENTER PROC ALLOC   61
0818:55.587         12  PERIODIC CHECK     14
0818:55.587         13  PROCESS .CRTSQ     89
0818:55.587         14  ENTER PROC ALLOC   61
0818:55.588         15  ENTER MEMORY ALL   62
0818:55.588         16  ENTER PROC ALLOC   61
0818:55.588         17  GEWAKE S/D BUSY    18             CPS        640000
0818:56.558 •       18  BUILD INPUT REC    20    1 <TN>  GEROUT STAT 000004                    IFLG2 000000100000000000
0818:56.558 •       19  SCAN COMMAND LIS   82    1 <TN>  REMC
0818:56.561         20  ENTER PROC ALLOC   61
0818:56.561         21  NEXT PRIMITIVE I   64    1 <TN>  XCALL      1 LEVELS
0818:56.562         22  NEXT PRIMITIVE I   64    1 <TN>  CALLP      1 LEVELS
0818:56.562         23  CALLP PRIMITIVE     8    1 <TN>  CMDL       2 LEVELS
0818:56.562         24  NEXT PRIMITIVE I   64    1 <TN>  EXEC       2 LEVELS
0818:56.563         25  EXEC PRIMITIVE     10    1 <TN>  CMDL       2 LEVELS
0818:56.563         26  ALLOCATOR SERVIC   60    1 <TN>  NEW TASK IN CALC                      IFLAG 000000000000000000
0818:56.563         27  TIME TYPES         80    1 <TN>                                        NEW-  WAIT NORM.  OLD-  OUT OF MEM.
0818:56.564         28  ENTER PROC ALLOC   61
0818:56.564         29  ENTER MEMORY ALL   62
0818:56.565         30  ATTEMPT MEM ALLO   77    1 <TN>  PGM SIZ-        2042
0818:56.565         31  MEM MAP CHANGE     78    1 <TN>                                        SYSLAL 066  SYSSIZ 004
0818:56.566         32  TIME TYPES         80    1 <TN>                                        NEW-  SWAP/LOAD.  OLD-  UNKNOWN
0818:56.568         33  ENTER MEMORY ALL   62
0818:56.568         34  ENTER PROC ALLOC   61
0818:56.569         35  PERIODIC CHECK     14
0818:56.569         36  PROCESS .CRTSQ     89
0818:56.570         37  GEWAKE S/D BUSY    18             CPS        640000
0818:56.598 •       38  TIME TYPES         80    1 <TN>                                        NEW-  USEFUL MEM. OLD-  SWAP/LOAD.
0818:56.600         39  ENTER PROC ALLOC   61
0818:56.600         40  MAKE S/D ENTRY     91    1 <TN>
0818:56.601         41  GEWAKE S/D BUSY    18             CPS           640
0818:56.604         42  ENTER PROC ALLOC   61
0818:56.604         43  S/D FAULT QUEUE    88    1 <TN>  CPS             12                    DRI         FAULT
0818:56.605         44  PROCESS DRI        23    1 <TN>  PASUST,  IC= 000147
0818:56.605         45  DRL COMPLETE      104    1 <TN>
0818:56.606         46  MAKE S/D ENTRY     91    1 <TN>
0818:56.606         47  GEWAKE S/D BUSY    18             CPS           640
0818:56.609         48  ENTER PROC ALLOC   61
0818:56.610         49  S/D FAULT QUEUE    88    1 <TN>  CPS             58                    DRI         FAULT
0818:56.610         50  PROCESS DRI        23    1 <TN>  FILACT,  IC= 002017
0818:56.611         51  ISSUE MME GEFSYE   27    1 <TN>                                        GEFSY FUNC- FILE ALLOCATE
0818:56.611         52  ALLOCATOR SERVIC   60    1 <TN>  TURN ON I/O RDBLK                     IFLAG 000010000000001000
0818:56.661         53  ENTER PROC ALLOC   61
0818:56.661         54  GEWAKE S/D BUSY    18             CPS        640000
0818:56.693 •       55  GEFSYE/27 COMPLE   29    1 <TN>
0818:56.694 •       56  ALLOCATOR SERVIC   60    1 <TN>  TURN OFF I/O RDBLK                    IFLAG 100010000000001000
0818:56.696         57  ENTER PROC ALLOC   61
0818:56.696         58  MAKE S/D ENTRY     91    1 <TN>
```

Figure 15-28. Formatted Dump Report

TSS REDUCTION, VERSION 7.2 - 1.000, 30 SEPTEMBER 82

DISTRIBUTION COLLECTED ON SYSTEM DSCC1 AT 0818:33.201 FRI 82-05-21. INITIAL GMC TAPE #1469

INTERTRACE TIME

INDIV. NUMBER	CUMUL. NUMBER	CUMUL. PRC	INDIV. PRC	MILLI-SEC	PERCENT OF OCCURRENCE 00 10 20 30 40 50 60 70 80 90 100 I....I....I....I....I....I....I....I....I....I....I	HISTOGRAM 5
1077956	1077956	98.569	98.569	0- 63	IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	
7802	1085758	99.283	0.713	64- 127	I	
1743	1087501	99.442	0.159	128- 191	I	
1304	1088805	99.562	0.119	192- 255	I	
877	1089682	99.642	0.080	256- 319	I	
461	1090143	99.684	0.042	320- 383	I	
333	1090476	99.714	0.030	384- 447	I	
313	1090789	99.743	0.029	448- 511	I	
271	1091060	99.768	0.025	512- 575	I	
229	1091289	99.789	0.021	576- 639	I	
256	1091545	99.812	0.023	640- 703	I	
196	1091741	99.830	0.018	704- 767	I	
148	1091889	99.844	0.014	768- 831	I	
124	1092013	99.855	0.011	832- 895	I	
124	1092137	99.866	0.011	896- 959	I	
183	1092320	99.883	0.017	960-1023	I	
96	1092416	99.892	0.009	1024-1087	I	
88	1092504	99.900	0.008	1088-1151	I	
73	1092577	99.906	0.007	1152-1215	I	
70	1092647	99.913	0.006	1216-1279	I	
56	1092703	99.918	0.005	1280-1343	I	
75	1092778	99.925	0.007	1344-1407	I	
46	1092824	99.929	0.004	1408-1471	I	
43	1092867	99.933	0.004	1472-1535	I	
44	1092911	99.937	0.004	1536-1599	I	
43	1092954	99.941	0.004	1600-1663	I	
53	1093007	99.946	0.005	1664-1727	I	
39	1093046	99.949	0.004	1728-1791	I	
39	1093085	99.953	0.004	1792-1855	I	
27	1093112	99.955	0.002	1856-1919	I	
32	1093144	99.958	0.003	1920-1983	I	
26	1093170	99.961	0.002	1984-2047	I	
22	1093192	99.963	0.002	2048-2111	I	
22	1093214	99.965	0.002	2112-2175	I	
20	1093234	99.967	0.002	2176-2239	I	
22	1093256	99.969	0.002	2240-2303	I	
26	1093282	99.971	0.002	2304-2367	I	
13	1093295	99.972	0.001	2368-2431	I	
15	1093310	99.973	0.001	2432-2495	I	
15	1093325	99.975	0.001	2496-2559	I	
15	1093340	99.976	0.001	2560-2623	I	
7	1093347	99.977	0.001	2624-2687	I	
11	1093358	99.978	0.001	2688-2751	I	
13	1093371	99.979	0.001	2752-2815	I	
10	1093381	99.980	0.001	2816-2879	I	
4	1093385	99.980	0.000	2880-2943	I	
7	1093392	99.981	0.001	2944-3007	I	
9	1093401	99.982	0.001	3008-3071	I	
11	1093412	99.983	0.001	3072-3135	I	
10	1093422	99.984	0.001	3136-3199	I	
2	1093424	99.984	0.000	3200-3263	I	
7	1093431	99.985	0.001	3264-3327	I	
7	1093438	99.985	0.001	3328-3391	I	
4	1093442	99.986	0.000	3392-3455	I	

1093600 ENTRIES TOTAL AVERAGE = 6.97210 VARIANCE = 8474.988 STANDARD DEVIATION = 92.060
158(0%) OUT OF RANGE AVERAGE FOR THESE = 4968.54 IN RANGE AVERAGE = 6.26

Figure 15-29. Intertrace Time Histogram

15.5.1.2 <u>Response Time Logplots</u>. The response time logplots show delay time that users experienced waiting for a response from TSS. They are:

- o Response Time For All Users (figure 15-3)
- o Response Time For Users Not Requesting More Core (figure 15-5)
- o Response Time For Users With Core Request During Line Idle (figure 15-6).

(Logplots are described in more detail in section 15.3).

The All-Users logplot shows, from time interval to time interval, the minimum, average, and maximum amount of time a user waited for a response. The user who waited longest is identified under the column LINE. An individual wait may extend over more than one interval. In this case the time value used on a plot line will be the total amount of time since the start of the line-idle state (not just the portion of time in that plot line period). This logplot should indicate periods of time when users were dissatisfied with TSS performance.

The information used on the All-User logplot is also used on two other logplots. These logplots help to indicate times when the source of response time degradation is due to swap area competition. The wait times are distributed on the second and third response time logplots on the basis of a request for core during the line-idle period (e.g., call to subsystem, or swap in). Differences in these plots (high response times on figure 15-6 and lower response times on figure 15-5) would be explained by Swap Area Competition. The three figures in this document would indicate that swap areas were not a problem. In fact, the only terminal experiencing difficulties appears to be terminal ID whose response time keeps on increasing during each interval.

15.5.1.3 <u>Subdispatch Time Logplots</u>. The subdispatch time logplots show delay time for subsystems in obtaining service by GCOS and TSS Executive. They are:

- o Total Time in Subdispatch Queue (figure 15-7)
- o Time in Subdispatch Queue Waiting Service (figure 15-8)
- o Processor Time in Subdispatch (figure 15-9).

The left-hand side of the three reports are the same from the "USERS" column to the "I/O-BSY" column. The "USERS" column is the count of users in the time-interval ending at "TIME". During each interval, the total number of subdispatches performed is contained in the column "#SD". The value in the "CPU" column is the percentage of total amount of time in subdispatch queue during which the processor was executing TSS user subsystem code (the remainder being queue overhead time). The percentage of these subdispatches which ended as a timer runout fault (vs. a DRL fault) are indicated in the column "TROUTS". The percentage of subdispatches executed for subsystems which, concurrently, had an outstanding I/O to the terminal is reported in the "I/O-BSY" column. The "LINE" field indicates the line-ID of the user who contributed the datum for that line of that plot with the greatest magnitude (see below for an explanation of the data that is plotted on each of the reports).

The right-hand side of the "Total Time" logplot shows, from time interval to time interval, the minimum, average, and maximum duration of all subsystem subdispatches. The time value used as data for this logplot is measured from the event at which the TSS executive creates a "ready entry" in the subdispatch table, to the event at which the executive recogizes that GCOS has completed processing by changing the entry to a "fault entry".

The two constituents of each time value contributing to the "Total Time" logplot are segregated to produce the right-hand sides of the "Waiting Service" and "Processor Time" logplots. The first of the two values is the sum of the time that the "ready entry" waited for allocation by the CPU allocator, and the time that the "fault entry" waited to be detected by the TSS executive. The second value is the actual processor time used by the subsystem (between "ready entry" and "fault entry" states).

15.5.1.4 <u>CPU Times Allocated to TS1-Exec and TS1-Subdispatch Report</u>. The CPU time allocation chart (figure 15-4) shows the distribution of processor time attributable to the TS1 Executive, to the TSS subdispatch mechanism, to all non-TSS customers, and to the idle state. This report is produced only if the CPU Monitor (CPUM) was in execution when the data tape was written. Data collection for each print line is independent of other TEARS procedures, however the trigger to print a line is synchronized with the response time logplots. Thus, the accumulation of CPU data into this report will "get ahead" of other TEARS reports when a large gap exists between TSS traces. Here's why:

> Time driven reports, including this one, are based on TSSM trace times alone, not on CPUM trace times. If a large gap exists between TSSM traces, one or more successive "times-to-print" may expire without any printing. During the TSSM trace gap, however, CPUM traces continue to be generated and accumulated into this report. When TEARS eventually finds the long delayed TSSM trace time stamp, it triggers plot lines at successive plot intervals until it catches up with the time stamp. At the first such trigger, all the accumulated CPU data is included in the print line; successive triggers will, of course, find no additional CPU data to print. The mechanism just described explains (1) the blank lines in the CPU Time Allocation report, and (2) the greater-than-expected CPU times immediately preceeding a blank line. The mechanism was deliberate so that gaps in TSS service are obvious.

Because this mechanism differs from the other TEARS time-driven reports, and to fully describe the scope of the data for each print line, the first three columns of the report are devoted to time data. In Figure 15-4, our sample report, the first item shows the expected "time-to-print" (PLOT TIME

REFERENCE). The next two columns show the time of the last CPU trace processed in the previous print line (FIRST T70 TIME) and the last CPU trace processed in the current print line (LAST T70 TIME) -- that interval, first to last, expresses the actual elapsed time over which the CPU data pertains. The next item is the number of CPU traces on which the data is accumulated (NUMBER OF T70S). The right half of the report is a tabular chart showing the CPU time, in seconds, attributed to the TS1 Executive (TS1-EXEC), to the TSS subdispatch mechanism (TS1-SDSP), to the idle state (IDLE-TIME), and to all non-TSS consumers (OTHER-CPU). The last numeric column is a total (TOTAL) of the preceeding four columns. The graphic to the extreme right shows the deviation of the total CPU time from that expected based on the plot interval. Each "+" to the right of the axis ("I"), shows a 10% deviation "greater than expected". An asterisk replaces the "+" when the deviation is 100% or greater. Deviations in the other direction are shown as "-" symbols to the left of the axis.

For a normally functioning system under moderate load, the number of CPU traces approximates 1 for each 2 CPU-seconds. If the plot interval is so small or CPU activity so light that fewer than about five CPU traces are collected for each print line, the report will show false abnormality. Thus, an "abnormal" report may result from (1) low CPU activity, (2) too short a plot interval, or (3) gaps in TSS service.

15.5.1.5 TSS Subtraces Encountered, and Derails Executed by Users. The two summary histograms "TSS Subtraces Encountered" (figure 15-10) and "Derails Executed by Users" (figure 15-11) are incorporated in the pass to show the presence and volume of those traces/events within a timeframe.

15.5.2 TEARS Emulation Reports. The TEARS Emulation phase is both trace driven and elapsed-time driven; the distinction also separates two categories of reports for the user. Reports driven by trace events correspond with mimicking TSS - they give evidence of user difficulties and delays or of TSS Executive difficulties and delays. The reduction program remembers, on a short term basis, what each TSS user was attempting to do, the obstacles encountered in the attempt, how long the attempt was ongoing, and some of the computer resources used in the attempt. Report entries are made when some threshold, usually based on time delay, is exceeded or when a service denial, failure, or error thwarts the user. The program also measures the frequency with which the TSS Executive did its work - a report entry follows a delay threshold.

Reports driven by elapsed time measure several TSS functions without regard to any particular user -- they report measures of the subdispatch mechanism, memory activity, and the user disk I/O functions among others.

Several reports participate in a superior-subordinate arrangement; only selected entries in the superior report cause an entry in the subordinate report. The Users' Map is subordinate to the Exception Message Report and the TSS Core Map is subordinate to the TSS Delay-User Delay Report. They are event driven reports. One elapsed-time driven report, the Memory Activity report, is subordinate to the logplot of Intertrace Gap but only for synchronization convenience.

15.5.2.1 Exception Message Report. When a request for sore system service, TSS or GCOS, is denied or terminates with an error, an entry is made in this Exception Message Report (figure 15-12). This report also controls (triggers) item entries in the Users' Map, section 15.5.2.2, for several of the errors/denials. The entries are categorized by function/origin into four classes: TSS, FMS, Derails, and the inevitable Miscellaneous.

An additional entry identifies those users who consume excessive CPU resources (no denigration of the user is intended, nor should you infer it). The intent of the entry is (1) to correlate an apparently excessive response time pattern with a user engaged in CPU intensive work (with occassional messages to his terminal), and (2) to identify the magnitude of such work.

A contrived example of the Exception Message Report is given as figure 15-12. It provides one example of each possible error message. Reading from the left, you can see the time (TOD) and sequence number (RECNO) of the trace which captured the denial/error. Time of day is represented as HHMM:SS.sss. The current trace sequence number is relative to the first TSS trace following GMC start. This is followed by the message proper, shown under the heading EXCEPTION MESSAGE. We list the user's terminal ID and his USERID, if applicable, followed by the error message. Error messages are taken directly from Honeywell publications, and some are cryptic. For excessive CPU usage, an exception is declared when the accumulated CPU time, since swapping in, exceeds 64,000 clock pulses; the CPU time is checked each time a user is removed from the subdispatch fault queue.

To reduce repetitious entries for the same user, such entries are inhibited so as to print not more than once per second. The graphic to the right of an entry shows one dot, up to 30, for each inhibited "print" of the previous entry for that user. An asterisk following the time of day indicates that an accompanying entry in the Users' Map report has been made.

15.5.2.2 Users' Map. This report (figure 15-13) is driven by the Exception Message Report for several exception entries. Recall that in the parent report (section 15.5.2.1), the triggering entry is marked with an asterisk following the time of day. The same entry from the parent report is again printed on the Users' Map as the reason for the map. Following the reason is the users' map proper. It displays, in inverse core location order, all current TSS users and their status. We show the user sequence number (USR), his full address (USTOCT) in octal, his line/terminal identification (LID) and his user identification (USER-ID). The user sequence number is a TEARS-generated subscript into a set of program tables, while LID shows the line ID written either as id| for terminal sessions, or as NNNN for DRUN sessions (where NNNN is the DRUN number). Following the user identification is user state data -- how long the user has dwelled in his current state (TIME-IN) in milliseconds and his current state (STATE) in mnemonic form (viz, table 15-1). If terminal I/O is in progress, a "T" (for true) is printed in the next column (TRMIO). We then show the number and mnemonic of the last recorded trace (LAST-TRACE) and the last recorded derail (DERAIL) for the user. The following items report the last recorded program size (SIZE) and an indicator that core is currently assigned ("T" for true). The last item shows the entire program stack (PROGRAM-STACK); an asterisk following the top of stack denotes a user in build mode.

15.5.2.3 TSS Delay - User Delay Report. This is the most complex TEARS report (figure 15-14). It is a time-ordered merge of two separate event histories so that user delays rooted in TSS delays become obvious. It also reveals some TSS delays caused by user service requests, the most abundant being security package requirements (.FS049 during DRL DEFIL). This report also controls (triggers) item entries in the TSS Core Map, section 15.5.2.4, for users waiting core too long.

From the left in figure 15-14, the columns TOD, RCNT, and CUR are common to both TSS delay and user delay entries; they show the current time of day, the sequence number of the current TSS trace, and the subtype of the current TSS trace. Time of day is represented as HHMM:SS.sss. The current trace sequence number is relative to the first TSS trace following GMC start, and the subtype tells which of the 105 traps caused the trace. An asterisk following the current trace number identifies a trace performed in courtesy call. The remainder of the report describes a TSS delay, a user delay, or a concurrency of both types of delay. In figure 15-14, examples of all three-type entries appear. To highlight specific entries in figure 15-14 for further discussion, those entries are enclosed in braces and marked with a key letter (A, B, ...). Reference to these specific entries is made by a phrase such as "Key Z...".

Key A is an example of TSS delay reporting - it shows a 1-second delay (DLAY) between trace subtypes 18 and 61 (PRV, CUR), where the delay is printed as rounded seconds. Subtype 18 is a "Gewake with subdispatch busy" and subtype 61 is an "Enter processor allocation." TEARS program logic identified the subtype 18 trace as the "cause" by executive delay (XEC); this means that the TS1 executive gave up the processor with a GEWAKE and was delayed at least 1 second longer than the GEWAKE time. Thus the delay was external to TSS, and cannot be further localized. The indicators of external-to-TSS delays are the following subtypes (PRV):

15, "Gewake - no users"
17, "Gewake until subdispatch done"
18, "Gewake with subdispatch busy"
72, "Issue GEMORE for memory"
102, "Issue remote inquiry GEROUT".

and (CUR):

61, "Enter processor allocation"
89, "Enter routine to process queue".

The central portion of the report entry (columns DRL through USR-I/O) is a tableau that links functional areas with last known trace subtypes for any user. The functional areas are the column headers and represent derail service (DRL), File Management Supervisor service (FMS), and disk service (USR-I/O). The functional areas are ones in which TSS delays have been observed or are possible; column entries are the trace subtypes associated with such a TSS delay. If a linking is made, it is only a suggestive or circumstantial cause of delay. Several disparate linkings are possible, as is a failure to make any linking at all. The possible linkings are as follows:

For derails (DRL), the unique entry is trace subtype 23, "Process derail."
File Management Supervisor delays (FMS) are associated with two trace subtypes - subtype 27, "Issue MME GEFSYE" and subtype 45, "Call .MFS19 for file grow."
Users requesting disk I/O (USR-I/O) have caused TSS delays with trace subtype 24, "Request file I/O", and subtype 41, "Load subsystem with DRL RESTOR."

The right half of the report (Key A remains the referent) is a snapshot of all current users. The items reported for each user are "as of" just after the current trace was processed. Each user is identified by user sequence number (UST), terminal identification (LINE), and user identification (USERID). Following this, the time the user has dwelled in his current state (DLAY) is shown as rounded seconds and the current state (STATE) is printed. Following the state, an asterisk in column T marks a user engaged in terminal I/O. The next two columns display the last recorded trace subtype (PRV) and the last recorded derail type (DERAIL) for the user. Next, the last known program size (SIZE) is dimensioned as words-of-memory/1024. The last item shows the top three (of a possible five) members of the user's program stack (PROGRAM STACK). An asterisk following the top of stack denotes a user in build mode.

Notes:

(1) In this example, Key A, the total time between the listed traces was 1 second (rounded); program logic detected the delay as excessive because the time between listed traces was at least 1 second (not rounded) longer than the GEWAKE time.

(2) In single processor systems, the delay would not have been detected, since GEWAKE time is not available. (Program logic would have taken the GEWAKE time to be very large. The logic could as well have taken the GEWAKE time to be very small. We chose the former alternative to eliminate false alarms).

(3) It is possible that TSS traces performed in courtesy call appeared within the interval bracketed by "PRV,CUR"; they are ignored within (the TSS delay part of) this report.

Key B is an example of user delay reporting. This type entry is made only for users who are delayed in a vulnerable state (refer to table 15-1). Further, an entry is made for a user only when a trace attributable to that user is the current trace. Except for the state "waiting for memory" (mnemonic WTMEM), a delay is detected when state occupancy exceeds 1 second. For the state "waiting for memory", a delay is detected when state occupancy is 1 second longer than the wait time computed on program size.* The items reported for a delayed user are "as of" just before the current trace was processed. The data items are the same as described above for the user snapshot portion of TSS delay entry.

Key C is an example of user delay reporting while waiting memory. The asterisk following the time-of-day indicates that an accompanying entry in the TSS Core Map Report has been made.

Key D is an example of a concurrent TSS delay and user delay where TEARS logic failed to identify the cause (.FS049 in DRL DEFIL) but inspection can. The trace subtype which caused the problem was a "derail" (trace subtype 23) and the derail was a DEFIL. After the DRL DEFIL began, a "terminal I/O complete" (subtype 87) in courtesy call was trapped, and that trap caused TEARS logic to "forget about" the derail although the state was preserved. The clues to the interpretation are the values under user state, DRLSR, the last known derail, DEFIL, and the fact that the user delay and TSS delay are the same. (Logic error may be corrected in delivered version.)

Key E shows two user delay entries for the same user in the same state, but with a user option in force. To preclude repetitious entries for a user in the same state, a user option (option(onchange)) was selected here. It inhibited all but the first print following delay detection and the last print just prior to state change. The plus sign following the state indicates (a) the user's state will change as a result of the current trace and (b) the delay in this state for this user has been printed once before (but for a lesser delay time).

15.5.2.4 TSS Core Map. This report is driven by the TSS Delay - User Delay Report logic when it detects a user waiting memory too long. Recall that in the parent report (section 15.5.2.3) the triggering entry is marked with an asterisk following the time-of-day. The same entry from the parent report is again printed on the TSS Core Map as the reason for the map. Following the reason is the core map proper. It displays, in core location order, the

* TS1 computes an alarm time as a function of each user's program size. It will take no extraordinary action to obtain memory for a user until the time has expired. TEARS uses the same function (plus 1 second) to detect a delay when waiting for memory.

allocation of all the user reserved swap area. The allocation printout is condensed so that each line describes one user in core along with any free memory contiguously above him.

Reading from the left in figure 15-15, find the user sequence number (USR), and the starting address of his swap area (BASE) relative to TS1. The amount of core assigned (SIZE) is followed by the unused memory (FREE) contiguously above it. If no user occupies the lowest core slot, the first print line shows that as a HOLE in core. The remaining items of the print line describe the user and what he is doing.

The user is identified by his line identification (LID) and user identification (USER-ID). The next three items are timers dimensioned in milliseconds: the users's time in current state (TSTAT); time since last completed "swapping in" to core (TCORE); and accumulated CPU time (TCPU) since last completed swapping in to core. The next item is a measure of disk resource use -- since disk connect time is not available from within TSSM, we collect and print instead the number of disk I/Os (DIOS). This is followed by the mnemonic for the last recorded derail (LSTDRL), the entire program stack (PROGRAM STACK), the complete address of the user's UST (USTOCT) in octal, and the user's current state (STATE). If terminal I/O is in transmission, a "T" (for true) is printed in the next column (TRMIO). The last item is the mnemonic of the last recorded trace (LAST TRACE) for the user.

Notes:

(1) Core allocated to a user as Extended Buffer Memory is indicated as such by printing "---ebm---" in place of the program stack (PROGRAM STACK).

(2) The items TCORE, TCPU, and DIOS for a user just swapping in may be misleading -- because a user swapping in has core assigned as shown in the core map, but he is not considered in core. The three items mentioned are "as of" the completion of his previous swap into core.

The Core Map must be interpreted in conjunction with its parent to avoid wrong inference. In particular, a long delay waiting memory may be rooted in a TSS delay and thus is not a sign of memory allocation trouble. Also, not every excessive wait for memory (shown in the parent) results in a core map entry; to avoid redundancy, the core map print is completely inhibited if TEARS logic shows no change of core allocation since the last printed map. Further, the option described in section 15.5.2.3 that limits printing to "first and last occurrence" also limits the core map.

15.5.2.5 Error Message Report. The Error Message Report identifies conflicts between how the TSS works and how the TEARS designers expected it to work. Errors reported here are not fatal to the reduction pass and will not invalidate analysis. Nevertheless, the errors should be reported to

C751 for program correction. The report format is identical with the Exception Message Report described in subsection 15.5.1.1. Figure 15-16 is both a sample report and a list of the known errors as of the version number and compilation date shown.

15.5.2.6 Intertrace Gap - Duration. This logplot is an attempt to graph the time between TSSM traces while subtracting out the expected duration of any TSS Gewakes. The goal is a graph in which large gaps represent periods of delayed service and not periods in which TSS was idling by design. To avoid contamination of the data by traces performed in courtesy call during the periods TSS was idling in Gewake, all courtesy call traces are excluded. Figure 15-17 is an example of this report. It plots the minimum, average and maximum time between traces that are not performed in courtesy call. Those gaps which include a Gewake are corrected by subtracting out the expected Gewake time. The plot also shows the number of users, the time of the plot line, and seven counts indicating the number of gaps in seven ranges of time. For example, the 4 column lists the number of gaps that were less than 4 milliseconds; the 8 gap, between 4 and 8 milliseconds, and so on. The same data set used here is also source for the histogram Intertrace Time described in subsection 15.5.2.16.

For single processor systems, the expected Gewake time is not available - the gap time following a Gewake is taken as zero.

15.5.2.7 Memory Activity Report. The TSSM subtraces 63 and 65 through 75 form the bulk of exceptional TSS Executive service in support of memory requirements for the user. Figure 15-18 is an example of this report. It is a time-driven tabular report; it is printed in synchrony with the logplot of intertrace times for convenience alone. Each print line shows the count of each of the traces 63 and 65 through 75 that were trapped during the plot interval. The traces are:

63, "Enter swap decision processing"
65, "Consider TSS size increase"
66, "Initiate size increase for urgent user"
67, "Set up fence for urgent user"
68, "Set up urgent user class memory reserve"
69, "Force swap"
70, "Terminate force swap"
71, "UST area increase by 1K"
72, "Issue Gemore for memory"
73, "Gemore successful"
74, "Memory release"
75, "Gemore refused or reduction not possible".

Together with the two logplots described in sections 15.5.2.11 and 15.5.2.12, the Memory Activity report provides a provisional and incomplete picture of TSS memory allocation service.

15.5.2.8 Eligibles for Subdispatch - Duration. This report plots the minimum, average and maximum wait-subdispatch-time (WTSUB state) in milliseconds for all users. The WTSUB state begins when TEARS logic determines that the user is eligible for subdispatch; it ends when the user is placed in the subdispatch queue. Each line of the logplot is a window of a length determined by user option (default is 20 seconds). The logplot shows the number of users, the time of the plot line, and the line ID of the user with the maximum time. It also shows seven counts indicating the number of waits in seven ranges of time. For example, the 1 column indicates the number of waits that were less than 1 millisecond. The 2 column indicates the number of waits that were between 1 and 2 milliseconds, etc. Figure 15-19 is an example of this report.

15.5.2.9 In Subdispatch - Duration. This report plots the minimum, average and maximum subdispatch time (SUBDS state) in milliseconds for all users. The SUBDS state begins when the user is placed in the subdispatch queue; it ends when TS1 finds the user in the fault queue. Each line of the logplot is a window of a length determined by user option (default is 20 seconds). The logplot shows the number of users, the time of the plot line, and the line ID of the user with the maximum subdispatch time. It also shows seven counts indicating the number of subdispatches in seven ranges of time. Figure 15-20 is an example of this report.

15.5.2.10 Eligible for and in Subdispatch - Duration. This report plots the minimum, average and maximum combined time of wait for subdispatch (WTSUB state) and in subdispatch (SUBDS state) for all users. An example of this report is given in figure 15-21. This logplot defines the length of a combination event in three ways. When a wait-subdispatch is followed by a subdispatch, the length of the event is from the start of the wait to the end of the subdispatch. If a wait-subdispatch is followed by something other than a subdispatch, the length of the event is from the start of the wait to the end of the wait. If a subdispatch is preceded by something other than a wait-subdispatch, the length of the event is from the start of the subdispatch to the end of the subdispatch. Each plot line is identical in format to both the Eligibles for Subdispatch, and the In Subdispatch logplots.

15.5.2.11 User Swaps - Swap Rate. This report plots the rate of core swapped, in K-words per second, for all users. Core to core swaps are not included. Each plot line is a window of a length of time determined by user option (default is 20 seconds). The logplot shows the number of users and the time of the plot line. The rate is defined as the total swapped core divided by the window interval. This logplot is not keyed on users' states but on swap events. Figure 15-22 is an example of this report.

15.5.2.12 User Swaps - Swap Amount. This report plots the average and total core swapped, in K, for all users. Each plot line shows the number of users, the plot line time, the line ID of the user with the maximum core swapped, and seven counts indicating the number of swaps in seven block sizes of core. This logplot is not keyed on user states but on swap events. Figure 15-23 is an example of this report.

15.5.2.13 User Swaps - Duration. This report plots the minimum, average and maximum swapping time in hundredths of a second and does not differentiate between swap in (SWPIN) states and swap out (SWPOU) states. The state begins when TS1 initiates the swap; it ends when the swap is complete. Along with the number of users, the time of the plot line, and the line ID of the user with the maximum swapped time, this logplot shows seven counts indicating the number of swaps in seven ranges of time. Figure 15-24 is an example of this report.

15.5.2.14 User I/Os - Duration. This report plots the minimum, average and maximum time all users were in disk I/O (DSKIO state) in hundredths of a second. Each plot line shows the number of users, the plot line time, the line ID of the user with the maximum I/O time and seven counts indicating the number of I/Os in seven ranges of time. Figure 15-25 is an example of this report.

15.5.2.15 In System Master Catalog Wait - Duration. This report plots the minimum, average and maximum time all users were in SMC wait (WTSMC state) in hundredths of a second. Each plot line shows the number of users, the plot line time, the line ID of the user with the maximum SMC wait time and seven counts indicating the number of SMC waits in seven ranges of time. Figure 15-26 is an example of this report.

15.5.2.16 Intertrace Time (Adjusted for TSS GEWAKES). This report is a histogram of the time between TSSM traces that are not performed in courtesy call. The intertrace time is corrected for Gewakes as explained in section 15.5.2.6. Data for the report is presented in rounded milliseconds. A sample report is given as Figure 15-27.

15.5.3 Formatted Dump Reports

15.5.3.1 Formatted Dump. The formatted dump is a debug or investigative tool for the technical user. It decodes most of the data fields which comprise each trace, correlates UST-bearing traces with the corresponding line ID and prints a one-line expansion of the trace. Were the report unlimited, one GMC data tape would generate enormous output. To filter this mass of data, the user options TIMEFRAME, TRACES, and LINES may be used as described in subsection 15.6.

Since the data content of the 105 trace 74 subtypes varies so widely, a generalized column descriptor heads the report. From left to right, each trace expansion shows: the current time-of-day (TOD) as HHMM:SS.sss; the sequence number of the current TSS trace (REC-CNT) beginning with the first TSS trace after GMC start; the name or mnemonic and subtype number (MNEMONIC & #) identifying the current TSS trace. If the trace bears UST information, the two columns, UST # and LINE, uniquely identify the user to which the trace is attributable -- the UST # is an internal subscript into a set of program tables, while LINE shows the line ID written either as id| for terminal sessions, or as NNNN for DRUN sessions (where NNNN is the DRUN number). The columns headed LITERAL and NOTES may contain decoded interpretations of various data fields within the trace -- in general, 12-character numerals and numerals with leading zeros are octal except that the data item lflg2 (i.e., .LFLG2) is binary. Any trace performed in courtesy call shows an asterisk following the current time-of-day. The subtype 90 trace is not decoded directly -- after a "90 sequence" does occur (and also at the start of a formatted dump), a list of current users is shown in line-item format:

current-time LINE id IS "user id" --LOGON AT logon-time

The subtype 105 trace contains too much data for a 1-line expansion. Currently, it is only cursorily expanded - LITERAL shows the trace A-register.

15.5.3.2 Intertrace Time. This report is a histogram of the time between TSSM traces. Data for the report is presented in rounded milliseconds. The report is of identical format to that described in section 15.5.2.16; a sample report is not repeated here.

15.6 Reduction Run-Time Options

The general card format for an option request is as follows:

COMMAND(PARAMETER-LIST)

where COMMAND is a keyword specifying what action is to be taken and PARAMETER-LIST, if required, provides data to accomplish the action. The COMMAND is interpreted through its sixth character, so the input must match the first six characters of a valid command. Shorter commands must match exactly.

Fourteen commands are recognized by the card input interpreter. The list below shows each command, the action to be taken, and in parentheses, the default implications:

- CPRINT — Print all time driven reports at a specified repetition period. (Print at 60-second intervals for response pass reports; 20 seconds for emulation pass reports).
- DEBUG — Activate the debug statements in one or more modules. (All debug statements are inactive).
- DUMP — Reserved for development.

o HISTOGRAM Modify a histogram report. (Histogram report parameters are as shown in table 15-2).

o LINES Restrict reduction to include or exclude specified line/DRUN ids. (No restrictions).

o NEW Prepare to accept another, or repeat, set of GMC data tapes and another set of option alteration commands for a following reduction run. (Reduction is complete when the current set is reduced).

o ON (1) Activate the reduction routines for a specified pass over the GMC data tapes. (Response time pass is active; emulation and formatted dump passes are inactive).

(2) Turn on one or more specified reports. (All reports are on).

o OFF Turn on one or more specified reports. (All reports are on).

o OPTION Enforce a special option. (All special options are inactive).

o PLOT Modify a logplot. (Plot parameters are as shown in table 15-3).

o STOP Stop reduction after processing a specified number of physical tape records. (No limit).

o TIMEFRAME

(1) Accept one to five time windows for overall data reduction or for specified reports. (Data reduction and report output are not time limited).

(2) Accept one to five time windows for debug output. (Debug output is not time limited).

o TITLE Accept a new title to be printed on all reports. ("TSS REDUCTION, VERSION 7.2 - 1.000, 1 JULY 82" is printed as the banner).

o TRACES Restrict reduction to include or exclude specified TSSM subtrace types. (No restriction).

15.6.1 Parameter List. The parameter list is a sequence of data items separated one from the next by a field of spaces. Any one space in the field may optionally be replaced by a comma or colon. A data item may be an alphanumeric, a quoted string, an integer, a real number or a null. Strings

Table 15-2. Histogram Default Parameters

REPORT ID	TRAILER FLAG	# INTERVALS	LOW VALUE	INTERVAL SIZE
1	OFF	54	1	1
2	OFF	54	54	1
7	OFF	39	-10	1
8	OFF	40	28	1
9	ON	54	0	64

Table 15-3. Plot Default Parameters

REPORT ID	# POINTS TO PLOT	Y-MINIMUM	ORDERS-MAGNITUDE
4	UNLIMITED	1.0	3.0
5	UNLIMITED	1.0	3.0
6	UNLIMITED	1.0	3.0
10	UNLIMITED	0.1	6.0
11	UNLIMITED	0.1	6.0
12	UNLIMITED	0.1	3.0
15	UNLIMITED	0.1	5.0
14	UNLIMITED	0.1	4.0
15	UNLIMITED	1.0	4.0
16	UNLIMITED	0.1	5.0
17	UNLIMITED	1.0	3.0
18	UNLIMITED	1.0	4.0
19	UNLIMITED	0.1	4.0
20	UNLIMITED	0.1	4.0
21	UNLIMITED	1.0	5.0

are enclosed in single or double quotes. Real numbers include the standard FORTRAN forms: for example, 12.34, 1234E-2, 1.234+1 are all accepted as the same number. A null is two consecutive commas or colons; it stands for a missing data item and for the separator fields on either side of the missing item.

The data acronym RID stands for a one- or two-digit integer specifying the report identification number of the report to be affected. Report identification numbers are shown in section 15.5. The specifications "integer-W", "alphanumeric-X", "real-Y", and "string-Z" require user input of an integer number in a field at most W wide, an alphanumeric in a field at most X wide, a real number in a field at most Y wide, and a quoted string in a field at most Z wide (not including the quote delimiters), respectively. Alphanumerics and strings exceeding the specified field width are accepted but are truncated to the right. Integers and reals exceeding the specified field width are rejected as illegal data. Integers may not contain a decimal point. Reals must contain a decimal point or an exponent. Reals are limited, for all data input, to a maximum of 14 characters including sign, decimal point and exponent. Reals without exponent are further limited to a maximum of 11 characters, including leading sign and decimal point. Numeric data items shorter than the specified field width are acceptable in all commands, but a null item is acceptable only where provided for.

15.6.2 Command Syntax. Each command with its parameter list must be complete on a single card, but more than one command may be placed on each card if spaces separate them. The parameter list may either be contiguous with the command keyword or spaces may intervene. The syntax for each command is given below.

TEARS permits reduction of the GMC data tapes in one of three phases: response time analysis, emulation analysis, or formatted dump analysis. The response time analysis routines are on, and the other phase routines are off, by default. The following commands may be used to exercise control over the reduction:

- o DEBUG Activate all debug; if emulation phase, load special debug link.

- o DEBUG(MODULE-NAME-1,...,MODULE-NAME-N)
  Activates the debug statements in the explicitly named modules, where MODULE-NAME-i, alphanumeric-6, is the FORTRAN name given to the subroutine, function or link. The modules currently nameable and the intent of the debug action, in parentheses, are shown below.

  | BUGDMP - additional debug link for emulation phase. (Performs an interlineated formatted dump and finite-state-machine dump of the 1000 traces preceeding a fatal failure of the emulation phase logic).

| CHANGER - decodes trace data for formatted dump. (Allows comparison of TEARS decoding with trace data).
| CHKPOINT - saves state of the emulation phase finite-state-machine to random file. (Verifies action of routine).
| DOTRAON - intermediate control routine for formatted dump. (Shows correlation of user sequence number (a major TEARS data structure) with TSS UST address).
| DOTRALIMIT - not a module but a control. (Limits formatted dump to one sample of each TSSM trace subtype).
| GETOKE - lexical analysis of card input. (Verifies action of routine).
| LOGPLOT - formats and prints logarithmic bar chart. (Prints arithmetic values in lieu of bar chart).
| NXTRECRD - tape input handler. (Verifies action of routine).
| SAMSON - controls emulation phase when within a reduction timeframe. (Performs formatted dump during emulation phase).
| SETSTATE - the finite state machine of the emulation phase. (Provides additional data in case of non-fatal errors).
| STATECHART - not a module but a control in the emulation phase. (Prints one table, at each plot interval, of the state transitions of the finite state machine during the interval).
| TIMESET - sets up array of start-stop times for user-specified reduction windows. (Verifies action of the routine).
| T90 - initializes reduction variables in accordance with TSSM trace subtype 90. (Verifies action of the routine).

The one shot subroutine GMFEXC, which reads the initial tape record, is executed before card input. It may be debugged by setting the program switch word, bit 11.

- o HISTOGRAM(RID, TRAILER-FLAG, NUMBER-OF-INTERVALS, LOW-VALUE, INTERVAL-SIZE)

  Turns on the histogram with report identification number RID, integer-2. Prints/does not print the histogram summary if TRAILER-FLAG is ON/OFF, alphanumeric-3. The new number of histogram intervals is NUMBER-OF-INTERVALS, integer-3. The new low value and interval size are LOW-VALUE and INTERVAL-SIZE, both integer-10. Note: In the current version, the number of intervals may not exceed 54.

The following two options are as above, but without change to the current specifications of those parameters not appearing in the list.

- o HISTOGRAM(RID , , NUMBER-OF-INTERVALS, LOW-VALUE, INTERVAL-SIZE)
- o HISTOGRAM(RID, TRAILER-FLAG)

- o LINES(SENSE-OF-RESTRICTION, "ID-1",...,"ID-N")
  Excludes from, or includes in, the formatted dump which only those lines/DRUNs listed. Exclusion is obtained when the SENSE-OF-RESTRICTION is DONTDO, alphanumeric-6; inclusion, when the SENSE-OF-RESTRICTION is DOONLY, alphanumeric-6. Up to 10 lines or DRUNs may be listed in 1 or several commands, but if the SENSE-OF-RESTRICTION changes, previous commands are discarded. Terminals/lines are specified by a string "ID", string-2; DRUNs, by a string "NNNN", string-4. String lengths must be exact.

- o NEW("TAPE-NUMBER")
  Flags TEARS to stop reading card input options and to proceed with data reduction. It also informs the program that another data reduction pass is to follow, and that the following pass is to lead off with the tape number specified by "TAPE-NUMBER", string-6. For that following reduction, the default options will prevail unless modified by option alteration cards following the NEW command. This command must be the last command on a card; commands following on the same card are discarded. Note: TAPE-NUMBER may optionally be of the form alphanumeric-6, NEW(AJ283) for example.

- o OFF Turns off all switchable reports.

- o OFF(RID-1,...,RID-N)
  Turns off the reports specified by report identification numbers RID-i, integer-2.

- o OFF(CATEGORY)
  Turns off all logplots or histograms depending on CATEGORY: PLOTS or HISTOGRAMS, both alphanumeric-2.

- o ON ON options use the same parameters as those shown above for the OFF command, with appropriate reversal of intent.

- o ON(PHASE-OF-REDUCTION)
  Turns on, or engages, exactly one of the three phases of reduction depending on the value of PHASE-OF-REDUCTION: RESPONSE, EMULATE, or FORMATDUMP, all alphanumeric-6. The response phase is on by default; all others are off. Only one phase may be accomplished on a single pass over the data tapes.

- o OPTION(CHOICE)
  Modifies action of the reduction program depending on the following values of CHOICE, each alphanumeric-6:

| ALLCORE
Expands the two emulation phase plots that depict User Swap amount and rate so as to include core-to-core movement. The expansion is imperfectly implemented and the option is not recommended.

| LOGSCALE
Inserts intermediate numeric values on the y-axis for all logplots.

| *MINUSDISKIO* or *-DISKIO*
Adjusts individual response times of the response phase by subtracting the time spent accomplishing each disk I/O in the line-idle period.

| MINUSSUBDISPATCH or -SUBDISPATCH
Adjusts individual response times of the response phase by subtracting the CPU time in subdispatch expended during the line-idle period.

| NOABORT
Reserved for development.

| ONCHANGE
Limits the trace driven report "TSS Delay - User Delay" of the emulation phase to print user delay items not more than twice: first, when the delay is initially recognized, and second when the delay is about to end.

| TK4014
Reserved for development.

- PLOT(RID, NUMBER-OF-POINTS, Y-MINUMUM, ORDERS-OF-MAGNITUDE)
  Turns on the logarithmic plot with report identification number RID, integer-2. The new number of points to plot is NUMBER-OF-POINTS, integer-10, maximum. The y-axis is bounded below by Y-MINIMUM, real-14, and above by Y-MINIMUM * 10**ORDERS-OF-MAGNITUDE, where ORDERS-OF-MAGNITUDE is real-14. (The exponent is truncated to integer before use; if that integer is not between 1 and 7 inclusive, it is arbitrarily set to 7.).

The following two options are as above, but without change to the value of those parameters not specified.

- PLOT(RID, NUMBER-OF-POINTS)
- PLOT(RID , , Y-MINIMUM, ORDERS-OF-MAGNITUDE)

- o STOP(RECORD-COUNT)

  Stops the data reduction pass after reading RECORD-COUNT, integer-10, physical records, maximum. One fewer records will be processed.

- o TIMEFRAME(RID, START-TIME-1, STOP-TIME-1,...,START-TIME-N, STOP-TIME-N)

  Turns on report with report identification number RID, integer-2. Accepts up to five start/stop pairs: START-TIME-i, STOP-TIME-i where each component of the pair is real-14. Times are input in psuedo-decimal form:

  HHMM.SSsss

  where HH is the hour in 24-hour format, MM is the minutes of the hour, SS is the seconds of the minute, and sss is the fraction of seconds. Up to five start/stop pairs may be specified for a given report. The count of five may be achieved in one or several commands, however, the lexical order must conform with the temporal order to get the results wanted. The final pair in a command may be abbreviated -- if only a start time is given, the stop time is permanently unbounded. If RID is zero, the time frame(s) bound the entire reduction, but the status of individual reports is unaffected. Histograms may not be individually delimited with the command.

- o TIMEFRAME(DEBUG, START-TIME-1, STOP-TIME-1,...,START-TIME-N, STOP-TIME-N)

  Accepts up to five start/stop pairs:

  START-TIME-i, STOP-TIME-i

  where each component of the pair is real-14, to further delimit the action of debug statements. The limiting action becomes effective as soon as the program determines "what time it is". This command must be accompanied by some form of the DEBUG command or no debug output will be produced. The time frames are independent of, though not unaffected by, any other user selected timeframes.

- o TITLE("NEW-TITLE")

  Accepts the string "NEW-TITLE", string-63, as the new banner to head all reports.

- o TRACES(SENSE-OF-RESTRICTION, TRACE-1,...,TRACE-N)

  Excludes from, or includes in, the formatted dump only those trace subtypes listed. Exclusion is obtained when the SENSE-OF-RESTRICTION is DONTDO, alphanumeric-6; inclusion, when the SENSE-OF-RESTRICTION is DOONLY, alphanumeric-6. As many traces as required may be specified by TRACE-i, integer-3, in one or several commands; however, previous commands are discarded if the SENSE-OF-RESTRICTION changes from DONTDO.

15.6.3 Examples. The following are samples of the user optional commands:

```
NEW(1234)                  Begins a fresh run with tape #1234 as lead
                           tape.
DEBUG                      Turns all debug statements on.
DEBUG(TIMSET)              Turns on debug statements in subroutine
                           timeset.
HISTOG(1 ON)               Turns trailer flag on for histog 1, also turns
                           on 1.
HISTOG(2, , 43, 1, 2)      43 buckets, lowval is 1, interval size is 2,
                           report is on.
CPRINT(123)                123 seconds between periodic reports & plot
                           lines.
LINES(DOONLY,"A4","T5","3225") Format dump only lines with IDs  a4|,
                               t5| and the DRUN with ID 3225.
                           Multiple "lines" are cumulative.
                           Command also applies to debug during the
                           analysis phase.
ON(1, 2 3)                 Turns on reports 1, 2 and 3. (All reports are
                           on by default).
PLOT(10, 200)              Plot 10 will stop after 200 points.
OPTION(-SUBDISPATCH)       Subtract users subdispatch time from his
                           computed response time.
OPTION(MINUSDISKIO)        Subtract users disk I/O time from his computed
                           response time.
OPTION(ONCHANGE)           Limits the TSS Delay - User Delay Report.
STOP(1234567)              Stop after processing 1234567 physical records.
TRACES(DONTDO, 1 9 78 43 66) Do not format traces 1 9 78 43 and 66.
TRACES(DOONLY, 12)         Format only trace 12.
                           "Dontdo" may be preceeded by a "doonly".
                           Multiple "traces" are cumulative.
                           Command also applies to debug during the
                           analysis phase.
TIMEFR(0, 0200.)           Data reduction starts at 0200:00 with no stop
                           time.
TIMEFRAME(10 234.58   0345.40) Plot is bounded by 0234:58 and 0345:40.
TIMEFR(0, 0234.58, 0345.4) Same for data reduction.
TIMEFR(DEBUG, 1142., 1150.) If debug is on, then debug statements are
                           bounded by 1142:00 thru 1150:00 independent of
                           main timeframes.
ON OFF(1)                  Two commands: turn on all reports except 1.
NEW(5677)                  Must be last command on card.
TITLE("TSS reduction, version 7.2 - 1.000, 19 July 82") Default title.
```

15.6.4 Card Input Errors. If the card input interpreter cannot understand a command keyword or data item, it will echo the entire card and mark the last correctly interpreted character position with the message "ILLEGAL COMMAND (or DATA) FOLLOWING...". Depending on the state of the interpreter, it may attempt to find the end of the incorrect command in order to pass on to a following command on the same card, or it may reject the remainder of the card; it will report which of the two actions was taken, and will then continue with card interpretation. In no case will an action confirmed by the interpreter be reversed or "undone" by a following error.

15.7 JCL for Reduction Execution.

The data reduction procedures consist of a single FORTRAN program having a main level and multiple links.

A sample JCL deck is presented in figure 15-30. The LIMITS card should be studied to meet user needs. The run time (999) and output limit (60K) may both be altered as required by the duration of the monitoring run. As a rule of thumb, run time will be approximately one-to-one with data collection elapsed time if all three passes are made in the same activity.

TEARS requires 44K of memory in order to execute plus an additional 2K for SSA space.

If no data cards are required, the JCL card

```
$     file    05,null
```

should be used in their stead.

15.8 Multireel Processing

If the GMC collected data is on more than one tape reel, TEARS will coordinate the change with a series of messages to the computer operator. These messages first warn the operator of an impending change, then direct the change, and finally, tell the operator of the tape number error if it has occurred. You can help smooth the transition from reel to reel by including MSG2 cards in the JCL deck listing the tapes which comprise the data set. Here are the messages directed to the computer operator:

a. PLEASE GET TAPE # yyyyy. IT WILL BE CALLED FOR SOON.

   This warns of the impending change, and names the next tape in sequence (yyyyy).

b. DISMOUNT OLD TAPE; --THEN MOUNT TAPE # yyyyy ON DRIVE zzzzz.

   This directs the change, naming the new tape number (yyyyy) and the specific tape drive (zzzzz).

c. WRONG TAPE JUST MOUNTED; CAN YOU MOUNT yyyyy ON DRIVE zzzzz (Y/N).

   This message is conditional -- it is sent when TEARS finds the wrong tape has been mounted (by comparing internally generated tape

```
##a,j
$       ident   1820251/30/1878,prc-krsch
$       msg2    **********************************************
$       msg2    ** please give it a "u" on tape error.
$       msg2    ** will use tapes ja176 and jb176 twice
$       msg2    **********************************************
$       select  b29idpx0/object/tears
$       limits  999,44k,,60k
$       tape    01,x3dd,,ja176,,gmf-t90,,den16
option(-subdispatch) option(-diskio)
cprint(20)
new(ja176)
on(emulate)
option(onchange)
$       endjob
```

Figure 15-30. TEARS JCL

labels), or when more subtle changeover errors cause TEARS to suspect the new tape is not correct. If the operator answers affirmatively, the message sequence begins again with message (b) above. If the answer is negative, TEARS will terminate the reduction pass gracefully. Otherwise, TEARS will repeat the message.

15.9 Tape Error Aborts

During the course of processing, the operator may be required to abort the data reduction program due to an irrecoverable tape error. If such a condition occurs, the operator should abort the job with a "U" abort. This will allow the data reduction program to enter its wrap-up section and produce all reports generated prior to the tape error.

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This Users Manual provides the information necessary for an individual to run all of the programs that are comprised in the Generalized Monitoring Facility. Program interrelationships are presented, as well as a general overview of the processing, input, and output procedures for each program. The Generalized Monitoring Facility is a sophisticated software monitor for the Honeywell 6000 computer systems.

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